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WAR DEPARTMENT.

MONTHLY WEATHER REVIEW.

(GENERAL WEATHER SERVICE OF THE UNITED STATES.)

NOVEMBER, 1888.

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PREPARED UNDER THE DIRECTION OF
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1889.

List of merchant marine steam and sailing vessels from which International Meteorological reports were received at the Office of the Chief Signal Officer, U. S. Army, Washington, D. C., in time to be used in the preparation of the Weather Review for the month of November, 1888.

Name of vessel.	Captain.	Name of vessel.	Captain.	Name of vessel.	Captain.
Br. s. p. Adriatic	Capt. J. G. Cameron.	Br. s. s. Greece	Capt. A. J. Jeffrey.	Br. s. s. State of Pennsylvania	Capt. A. J. A. Mann.
Advance	D. E. Griffiths.	Span. Guido	E. Lachiondo.	State of Texas	Gilbert Williams.
Alamo	S. Risk.	Br. Gussie	Robert Staples.	Straits of Gibraltar	Geo. Grigs.
Am. Alamo	G. S. Murray.	Ger. Hammonia	C. Hedrich.	Ger. Suevia	C. Ludwig.
Br. Alaska	E. J. Soiders.	Br. Helvetia	G. Cochrane.	Belg. Switzerland	J. Ueberweg.
Alene	H. Christoffers.	Ger. Hermann	A. Kohlman.	Ger. Teutonia	P. Busch.
Ger. Aller	F. F. Schreder.	Br. Hibernian	John Brown.	Br. The Queen	T. P. Heeley.
Allemania	F. McKay.	Holland	Thos. Foote.	Ger. Thuringia	G. Reysing.
Br. Alvena	Edward Bisson.	Hudson	H. E. Freeman.	Br. Tower Hill	H. Perry.
Ambrose	R. Helntze.	Am. Indiana	W. J. Boggs.	Ger. Trave	P. Boedrow.
Ger. America	A. Potjer.	Br. Iowa	E. W. Owens.	Br. Trinacria	G. Mitchell.
Dutch. Amsterdam	J. Evans.	Istrian	A. W. Bell.	Trinidad	W. J. Fraser.
Am. Andes	G. Brooks.	Italy	W. Pearce.	Tropic	J. Barker.
Br. Arizona	F. Matzenthin.	Jamaican	D. Edwards.	Umbria	W. McMichan.
Ascania	H. Low.	James Turpie	Wm. Smith.	Vancouver	C. J. Lindall.
Athos	W. H. P. Hains.	Kansas	W. Gleig.	Viola	L. Murray.
Aurania	J. D. Frasier.	Ger. Koln	G. H. Meier.	Virginian	T. H. Fox.
Austerlitz	W. H. Milner.	Fr. La Bourgogne	E. Franquel.	Venetian	E. Parry.
Avon	J. Treacry.	La Bretagne	M. de'Jousselin.	Belg. Waesland	H. Raschmann.
Baltimore	R. E. Hubbard.	La Champagne	Boyer.	Ger. Werra	R. Bussius.
Barracouta	John Yach.	La Gascogne	Sanielli.	Belg. Westernland	W. G. Randle.
Barrowmore	C. W. Behse.	Ger. Lahn	H. Hellmers.	Ger. Wieland	A. Albers.
Ger. Baumwall	M. Fiss.	Br. Lake Huron	F. Carey.	Br. Wisconsin	J. P. Worral.
Br. Bavarian	T. Aitkenhead.	Lake Superior	Wm. Stewart.	Ger. Wyanoke	R. B. Boaz.
Bedford	W. A. Beynon.	Lake Winnipeg	P. D. Murray.	Br. Wyoming	C. L. Rigby.
Belg. Belgenland	E. F. Canal.	Am. Lampasas	M. B. Crowell.	Dtch. Zaandam	W. Ponson.
Span. Benito Katenger	R. Vickers.	Fr. La Normandie	G. de Kernabiec.	Belg. Zeeland	C. H. Grant.
Br. Beresford	E. Kopff.	Dtch. Leerdam	G. Stenger.	*New York Herald Reports.*	
Ger. Bohemia	F. Manly.	It. Letimbro	M. di Marco.	Am. Algiers	J. W. Percy.
Br. Bordere	T. Dutton.	Br. Lord Clive	P. Urquhart.	Br. Alsatia	James Brown.
Bothnia	H. Bodsher.	Lord Gough	E. M. Hughes.	Alvo	D. Williams.
Ger. Braunschweig	S. Mowell.	Lord O'Neill	A. Ferris.	Anchoria	W. Brown.
Br. British Prince	E. H. Freeth.	Am. Lorenzo D. Baker	W. P. Wiley.	Am. City of Alexandria	John Deaken.
British Princess	R. Wills.	Louisiana	E. V. Gager.	City of Washington	J. W. Reynolds.
British Queen	W. Fitt.	Br. Ludgate Hill	J. Brown.	Br. Claribel	Clinkskell.
Brooklyn City	J. H. Malet.	Ger. Main	A. Jaeger.	Egypt	J. Sumner.
Buffalo	B. Leask.	Br. Maine	R. Griffiths.	Am. El Monte	J. W. Hawthorne.
Bulgarian	O. Winkler.	Am. Manhattan	Frank Stevens.	Knickerbocker	F. Remble.
Ger. California	John Robinson.	Br. Manitoban	W. Dunlop.	Ger Moravia	Barends.
Br. Canada	A. McDougall.	Am. Marmion	John H. Fisher	Am. New Orleans	T. P. C Halsey.
Caspian	H. M. Franck.	Br. Martello	Wm. Abbott.	Ger. Ocean	A. Voge.
Ger. Catania	A. McNicol.	Mentmore	R Boutcher.	*United States Naval.*	
Br. Carthaginian	H. Davison.	Michigan	H. Bocquet.	U. S. C. S. A. D. Bache	J. F. Moser.
Cattle	Henry Walker.	Michigan	S. Walters.	U. S. S. Atlanta	J. A. Howell.
Cephalonia	B. F. Doane.	Minnesota	R J. Blacklin.	U. S. S. Boston	F. H. Ramsey.
Cherokee	S. Wohlmuth.	Montreal	Joseph Wall.	U. S. S. Dale	Yates Sterling.
Chester	A. Campbell.	Nederland	C. H. Grant.	U. S. S. Despatch	W. S. Cowles.
Circassia	J. W. Catherine.	Neamore	G. Elliott.	U. S. S. Enterprise	B. H. McCalla.
Am. City of Augusta	F. S. Land.	Nestorian	John France.	U. S. R. S. Franklin	R. S. Richards.
Br. City of Berlin	F. M. Passow.	Neustria	P. Verriers.	U. S. S. Independence	J. W. Philip.
Am. City of Chester	A. W. Lewis.	Newport	Chas. C. Lima.	U. S. S. Lancaster	T. F. Kane.
Br. City of Chicago	John McIntosh.	New York	Geo. Mason.	U. S. S. Michigan	H. F. Picking.
Am. City of Columbia	Fred. Watkins.	Neerdland	H. K. Nickels.	U. S. S. Minnesota	G. C. Wiltse.
Br. City of New York	A. Redford.	Norrona	J. J. Iesikjen.	U. S. S. Monongahela	G. E. Wingate.
City of Richmond	W. G. Shackford.	Norseman	K. Williams.	U. S. S. New Hampshire	F. J. Higginson.
Am. City of Paris	H. Young.	Nova Scotian	R. H. Hughes.	U. S. S. Omaha	A. G. Kellogg.
Br. City of Rome	J. Wilder.	Nueces	J. Bolger.	U. S. S. Ossipee	Wm. Whitehead.
Am. City of San Antonio	E. C. Jennings.	Ohio	R. W. Sargent.	U. S. R. S. St. Louis	U.N. Scheenmaker
Br. Colina	F. Henderson.	Oranmore	B. Jones.	U. S. S. Vandalia	C. C. Carpenter.
Colon	W. Rencke.	Orinoco	J. S. Garvin.	U. S. S. Wabash	O. F. Heyerman.
Colonia	W. Lang.	Palestine	W. Whiteway.	U. S. S. Yantic	
Counsellor	J. Scrivener.	Parisian	W. H. Smith.	*Sailing vessels.*	
Crown Prince	D. Lawson.	Pavonia	A. McKay.	Br. bk. Abyssinian	H. Hughes.
Cuban	J. Russell.	P. Caland	A. Potjer.	Am. schr. Anna E. Krans	F. H. Pervere.
Dalton	R. S. Rigby.	Pennland	Rud. Weyer.	Ger. bk. Anna Thurman	R. Witt.
Denmark	John Craig.	Pennsylvania	E. B. Thomas.	Am. bg. Annie R. Storer	W. R. Storer.
Devonia	W. Topper.	Phoenician	A. H. Vipond.	Swed. bk. Arab Steed	O. Bergstram.
Donau	J. MacFarlane.	Polynesia	A. Kuhn.	Am. sp. Armenia	E. L. Carter.
Dorian	R. Graham.	Pomeranian	H. Dalziel.	Ger. bk. Charles Luling	C. Wiche.
Dryden	S Dechaille.	Pomona	J. Legoe.	Am. schr. City of Baltimore	L. S. Tawes.
Dupuy de Lome	R. Grey.	Ponca	W. Bowen.	Am. schr. Comet	W. H. Aldrich.
Br. Earnmoor	C. N. Mumford.	Powhatan	John Jenkins.	bk. Coryphene	Geo. Grasse.
Earnwell	W. Bakker.	Prins Fred. Hendrik	C. Rademaker.	Nor. Daggry	M. Svendsen.
Dtch. Edam	J. W. Bristow.	Rhaetia	H. Vogelgesang.	Am. Daisy Boynton	C. Harding.
Br. Egyptain Monarch	Th. Jungst.	Rhein	W. Kuhlmann.	Pilot boat E. C. Knight	J. F. Springer.
Ger. Elder	E. Sander.	Rhyniand	A. J. Griffin.	schr. Emma C. Knowles	F. Mayhew.
Elbe	H. S. Quick.	Rio Grande	Jas. F. Lewis.	sp. Emma F. Whitney	H. B. Rollins.
Am. El Paso	Wm. Tyson.	Roman	E. Mahlex.	Nor. Hanne	S. F. Munn.
Br. Erin	T. H. Erham.	Rosse	Thos. Henning.	Am. bg. H. B. Hussey	G. B. Rodgdon.
Esk	John Wilson.	Rugia	R. Karlowa.	Am. schr. Henry A. Faber	C. J. Slocum.
Ethiopia	T. Cook.	Saale	H. Richter.	Br. bkt. Henry Warner	J. T. Paine.
Fururia	S. de Feliceta.	Saint Asaph	C. H. Hossock.	bk. Iodine	Adam Smith.
Sp. Eusharo	H. L. Higgins.	Saint Ronans	C. Campbell.	Jennie Parker	G E. Barker.
Am. Excelsior	Thos. L. Weiss.	Samana	H. Bermpohle.	Pilot boat J. F. Loubat	J. McCarty.
Br. Exeter City	J. C. Norton.	Samaria	J. B. Watt.	Am. bg. John C. Noyes	Geo. B. Hix.
Fanita	E. Pinkham.	Santiago	R. Potter.	bkt. Jose E. More	A. Lenhard.
Federation	J. B. Sellers.	Sarmatian	W. Richardson.	bk. Lillian B. Jones	E. F. Petrie.
Fernland	D. Pearson.	Sarnia	J. Gibson.	Am. sp. Light-ship No. 45	Andrew Jackson.
Fort Williams	A. D. Hadley.	Scandinavian	John Park.	bk. Lizzie Carter	Goodman.
Franco	G. Collier.	Dtch. s. s. Schiedam	K. Mennenhes.	schr. Luther A. Roby	Benj. J. Clark.
Fr. France	R. Ringk.	Br. Scythia	T. Roberts.	bg. Mary Fink	D. B. Darrah.
Ger. Fulda	J. Hedderwick.	Span. Serra	F. de Luzarraga.	Br. bk. Maria Storeman	J. Pierce.
Br. Furnessia	F. Goicoechea.	Br. Servia	H. McKay.	Am. schr. Maud H. Dudley	D. W. Oliver.
Span. Gaditano	Wm. Magee.	Siberian	B. P. Moore.	Br. bk. Megunticook	W. W. Hatch.
Br. Galileo	J. B. Antealzag.	Sidonian	B. Jamison.	Am. bkt. Monsita	F. M. Wallace.
Span. Gallego	M. Murphy.	Slavonia	H. Schmidt.	Ger. bk. Orpheus	G. Krouel.
Br. Gallia	W. Kuhlewein.	Br. Spain	W. A. Griffiths.	Br. Sodium	Wm. Manson.
Ger. Gellert	F. J. Irving.	State of Georgia	G. Moodie.	It. bk. Teresa Accame	G. Boetto.
Br. Germanic	E. F. Park.	State of Indiana	A. Ritchie	Am. sp. Trojan	M. Mosher.
Glenogles	R. Webster.	State of Nebraska	A. G. Braes.	Br. bk. Valona	H. Andrews.
Glenroy	A. Bubner.	State of Nevada	J. A. Stewart.	Br. bk. Venturer	W. H. Frelich.
Ger. Gluckauf	C. E. Le Gallais.			Veritas	J. W. McCully.
Br. s. s. Grecian					

UNITED STATES SIGNAL SERVICE

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INTRODUCTION.

This REVIEW treats generally the meteorological conditions of the United States and Canada for November, 1888, and is based upon reports of regular and voluntary observers of both countries.

On chart i the paths of the centres of six areas of low pressure are shown; the average number traced for November during the last fifteen years being 10.9.

The areas of high and low pressure are discussed under their respective headings. Descriptions of the storms that occurred over the north Atlantic Ocean are also given, and their approximate paths shown on chart i, on which also appear the limits of fog-belts west of the fortieth meridian. No ocean ice was reported during the month.

The severest disturbances on the north Atlantic occurred over mid-ocean from the 6th to the 12th, and off the coast of the United States from the 22d to the 27th, when very low barometric pressure and gales of hurricane force were reported. In the vicinity of the Banks of Newfoundland fog was less frequently reported, while to the westward of the fifty-fifth meridian its occurrence was more frequently noted than for the corresponding month of 1887.

Chart ii exhibits the distribution of mean atmospheric pressure and mean temperature for the month. The mean temperature corresponded with the normal in many parts of the country. The greatest departures above the normal occurred in the north-central states, and in Manitoba they exceeded 7°. The greatest departures below the normal were noted in the northern and southeastern Rocky Mountain slopes, where they amounted to more than 6° and 5°, respectively. At a number of stations in the interior, southern, and northeastern parts of the country the maximum temperatures were higher than for any preceding November during the periods of observation.

Chart iii exhibits normal and current temperature curves for selected stations.

The distribution of rainfall for November, 1888, is shown on chart iv, and the normal precipitation for eighteen years is exhibited on chart v.

The precipitation was above the normal from the Mississippi River westward to the Rocky Mountains, and in nearly all districts east of the Mississippi, the greatest excesses occurring in Florida, and in districts along the southwest border, where two or three times the usual November rainfall was measured. It was below the normal in the east Gulf states, and over the northern portions of the country from the upper Lake region to the Pacific coast, the most marked deficiencies occurring in the extreme northwest and on the northern slope of the Rocky Mountains, where less than one-half the usual amount fell.

Chart vi exhibits the depth of snow on the ground at the close of the month. Similar charts showing the depth of snow on the ground on the 15th and the last day of each of the winter months will be published in the REVIEW. In the current month the depth of snow on the 15th was insufficient to admit of charting. This chart also shows the limits of freezing temperature during the month.

A very heavy snow storm occurred in northern Kansas on the 9th, and heavy snow was reported in the lower Saint Lawrence valley during the night of the 8–9th.

Chart vii exhibits tracks of West Indian hurricanes along the coast of the United States, and chart viii shows the meteorological conditions which attended the severe storm of November 23d–28th.

Commencing with July, 1888, the meteorological means for stations of the Signal Service have been determined from observations taken twice daily at 8 a. m. and 8 p. m. (75th meridian time). These hours of observation have been permanently adopted to supersede the former system of tri-daily observations taken at eight-hour intervals.

In the preparation of this REVIEW the following data, received to December 20, 1888, have been used: the regular semi-daily weather-charts, containing data of simultaneous observations taken at 133 Signal Service stations and 23 Canadian stations, as telegraphed to this office; 177 monthly journals and 181 monthly means from the former and 23 monthly means from the latter; 423 monthly registers from voluntary observers; 82 monthly registers from United States Army post surgeons; marine records; international simultaneous observations; marine reports through the co-operation of the Hydrographic Office, United States Navy, and the "New York Herald Weather Service;" monthly weather reports from the local weather services of Alabama, Arkansas, Colorado, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Michigan, Minnesota, Mississippi, Missouri, Nebraska, Nevada, New England, New Jersey, New York, North Carolina, Ohio, Oregon, Pennsylvania, South Carolina, Tennessee, and Texas, and the Central Pacific Railway Company; trustworthy newspaper extracts, and special reports.

ATMOSPHERIC PRESSURE (expressed in inches and hundredths).

The distribution of mean atmospheric pressure for November, 1888, as determined from observations taken daily at 8 a. m. and 8 p. m. (75th meridian time), is shown on chart ii by isobars. On July 1, 1888, the tri-daily observations of the Signal Service were superseded by observations taken twice daily at the hours named. A protracted series of hourly observations has shown that the difference is almost inappreciable between the mean pressure obtained from two observations taken at these hours and that determined from tri-daily observations taken at eight-hour intervals.

The mean pressure for November, 1888, was highest within an area bounded by the isobar of 30.15, which extended from the middle Atlantic states westward to the middle eastern Rocky Mountain slope and thence northwestward to the head-

waters of the Missouri and the upper valley of the Columbia. The highest mean reading reported was 30.20, at Lamar, Mo. The mean pressure was lowest over southern California and the lower valley of the Colorado, where it fell below 30.00, and in the British Possessions north of Montana, where a reading of 30.00 was noted at Swift Current, N. W. Ter.

A comparison with the pressure chart for October, 1888, shows that a general increase in pressure occurred, except along a small portion of the middle Pacific coast, where there was a slight decrease. The increase was most marked over the Canadian Maritime Provinces, where it was more than .30 over the east-central part of New Brunswick. From this locality it became less marked southwestward along the Atlantic coast to southern Florida, where it amounted to but .01 at Jupiter and .02 at Key West. From New England westward to the Rocky Mountains the increase generally exceeded .15, while over a greater part of the country south of the fortieth parallel and east of the plateau regions of the Rocky Mountains, except in the south Atlantic and Gulf states, the increase varied from .10 to .15. The only decrease noted was .02 at Eureka, Cal.

As compared with the normal pressure for November, the mean barometer readings for the current month were above the normal, except over portions of the middle and south Atlantic states, the Gulf States, the middle Rocky Mountain region, and the Pacific slope. The departures above the normal were greatest in New Brunswick, where they exceeded .15, from whence they became gradually less marked southwestward to the thirty-fifth parallel and westward to the upper valley of the Columbia; in the upper Rio Grande valley, southern New Mexico, and southern Arizona, they exceeded .05. The departures below the normal were greatest in California, where they amounted to .09 at San Francisco and Sacramento, from whence they became less marked northward to Vancouver Island, eastward to western Wyoming and Colorado, and southward to lower California. At Norfolk, Va., along the south Atlantic coast, over the eastern and middle Gulf states, and along the coast of Texas, the departures below the normal were less than .05, except at Pensacola, Fla., where a deficiency of .06 was noted.

BAROMETRIC RANGES.

The monthly barometric ranges at the various Signal Service stations are given in the table of miscellaneous meteorological data. The ranges conformed to the general rule, that is they increased with the latitude and decreased slightly, though somewhat irregularly, with increasing longitude. Along the Atlantic coast the extreme ranges varied from .21 at Key West, Fla., to 1.55 at Block Island, R. I.; between the eighty-second and ninety-second meridians, .54 at Pensacola, Fla., to 1.15 at Alpena, Mich.; between the Mississippi River and the Rocky Mountains, .65 at Brownsville, Tex., to .98 at Poplar River, Mont.; in the plateau and Rocky Mountain regions, .48 at Fort Grant, Ariz., to .95 at Fort Custer and Fort Assinaboine, Mont.; on the Pacific coast., .41 at San Diego, Cal., to .74 at Port Angeles, Wash.

AREAS OF HIGH PRESSURE.

Six well-defined areas of high pressure were observed within the limits of the stations of observation during the month of November. The reports indicate that all of these areas of high pressure originated to the westward of the Rocky Mountains. Four were first observed on the north Pacific coast and two in the region north of Idaho. The general direction of movement was to the south of east while west of the Mississippi River, and afterwards to the north of east. The mean latitude of these areas was to the south of the average track of high areas for November, and the movement was rapid after leaving the Rocky Mountains.

I.—The month opened with this area of high pressure central to the west of Oregon. It passed rapidly to the southeast, following the area of low pressure which was moving northeastward over the Lakes, and by morning of the 3d covered the west Gulf states, where the direction of movement changed to the north of east. The pressure at the centre decreased as it approached the Mississippi Valley and increased as the area extended over the Atlantic coast, the highest barometric reading being observed at Nantucket on the morning of the 5th, when the centre was southeast of that station.

II.—This area of high pressure also approached the stations from the north Pacific and was central in Oregon on the morning of the 5th, when a trough of low pressure extended from Texas to Lake Huron, and high area number i extended from Florida to Nova Scotia. The track pursued by high area number ii was slightly to the north of, and almost parallel to, that of number i. It moved southeastward to Kansas and thence northeastward to the Saint Lawrence Valley. While covering the Rocky Mountains it extended from the lower Missouri valley westward to northern California. On the 6th it apparently separated, the principal portion of the area moving over the Lake region with increasing pressure at the centre, while the western portion remained over the northern plateau regions, and after being reinforced from the north formed the area of high pressure traced as number iii.

III.—This area was first observed in Oregon on the 8th. After advancing eastward to the Rocky Mountains it apparently moved westward to the vicinity of Salt Lake City, where it was central on the morning of the 9th. It moved slowly southeastward during the succeeding twenty-four hours, preceded by heavy snows and rains in the central valleys during the 8th and 9th. It extended over the southern portion of the United States during the 10th, 11th, and 12th, attended by slightly colder, fair weather. After reaching the east Gulf states it moved northeastward along the Atlantic coast with increasing pressure at the centre, the maximum pressure, 30.60, occurring at Albany, N. Y., on the morning of the 13th, at which time this area had increased and covered all that portion of the country east of the Mississippi. It apparently changed direction on the 13th, disappearing over the Atlantic on the 14th.

IV.—Number iv was first observed in the region to the north of Idaho on the morning of the 13th, where it remained almost stationary until the morning of the 15th, when it extended over the northern Rocky Mountain stations, being central near Fort Custer, Mont., where the pressure was 30.50 and the temperature —10°. It moved slowly eastward, covering the eastern slope of the Rocky Mountains on the 16th, the central valleys and Lake region on the 17th, and New England and Nova Scotia on the 18th, the pressure increasing rapidly as it approached the coast, the maximum barometric reading, 30.86, being observed at Halifax, N. S., at the p. m. observation of the 18th. The easterly movement continued on the 19th, on which date this high area disappeared to the eastward of Sydney, N. S.

V.—Number v was first observed north of Idaho on the 18th, and was the only high area of the month that passed eastward to the north of the stations of observation. The pressure apparently increased rapidly during its movement eastward to the centre of the continent, where the barometer reached 30.74 on the 19th. The pressure remained high, but decreased slightly as the area extended over the Lake region and Saint Lawrence Valley from the 20th to 22d, after which it increased, attaining a maximum of 30.82 at Rockliffe, Ont., on the afternoon of the 22d. It moved eastward over New England and Nova Scotia during the 23d and 24th, and while central over Nova Scotia this area extended over the entire region occupied by the stations of observation east of the Rocky Mountains while the severe tropical storm, described as low area number vi, was moving northward over the ocean east of Florida.

VI.—Number vi was central near the north Pacific coast on the morning of the 26th. It moved slowly eastward, inclining slightly to the north, during the 27th, 28th, and 29th, extending over the upper Missouri valley. After reaching Dakota it extended southward over the eastern slope of the Rocky Mountains, and covered the central valleys at the close of the

month. The pressure increased during the easterly movement until it reached the northern plateau region, where it attained a maximum of 30.48 at Spokane Falls, Wash., on the morning of the 28th. After passing to the east of the Rocky Mountains the pressure decreased to 30.22 at the 8 p. m. report of the 30th.

The following table exhibits, in a concise manner, some of the more prominent characteristics of the high areas:

No.	First observed.			Last observed.		Duration.	Velocity per h'r.	Highest pressure.		
	Date.	Lat. N.	Long. W.	Lat. N.	Long. W.			Date.	Station.	Reading.
		°	°	°	°	*Days.*	*Miles.*			*Inches.*
I.....	1	43	125	41	65	4.0	39.6	5	Nantucket, Mass	30.38
II.....	5	43	121	49	71	3.0	36.1	8	Quebec, Quebec	30.54
III.....	8	44	119	40	67	6.0	22.9	13	Albany, N. Y.	30.60
IV.....	13	53	115	45	60	5.5	25.8	18	Halifax, N.S.....	30.86
V.....	18	53	117	50	59	8.0	15.1	22	Rockliffe, Ont.....	30.82
VI.....	26	44	124	42	99	4.0	14.6	28	Spokane Falls, Wash...	30.48
							*		Mean	30.61

*Average rate of progress, 25.7 miles per hour.

AREAS OF LOW PRESSURE.

During the month of November six well-defined areas of low pressure appeared within the limits of the stations of observation. The tracks of the centres of these areas of low pressure will be found on chart i. They moved to the north of east, those originating to the westward in the Rocky Mountain region moving more easterly than those first observed near the Atlantic coast. A remarkable feature of the tracks of these areas is that as the month advanced the areas of low pressure developed more to the eastward, and the direction of movement became more northerly; those first observed moved eastward from the central Rocky Mountain region, and those following developed in the southwest, Gulf, or Lake region, and moved northeastward; while the last named and most severe storm of the month probably originated in the West Indies, and moved almost directly northward along the coast. Chart i indicates that while the conditions favoring the development of these storms varied in location, they all apparently progressed toward a common centre in the region of greatest storm frequency near the north Atlantic coast.

The following table exhibits the principal facts regarding these low areas:

No.	First observed.			Last observed.		Duration.	Velocity per h'r.	Lowest pressure.		
	Date.	Lat. N.	Long. W.	Lat. N.	Long. W.			Date.	Station.	Reading.
		°	°	°	°	*Days.*	*Miles.*			*Inches.*
I.....	31*	41	108	52	68	2.0	45.8	3	Anticosti, G. of St. Law'ce	29.38
Ia	31*	41	108	40	92	1.5	25.0	7	Bird Rocks, G. of St. L.	29.56
II.....	4	37	103	51	58	2.5	43.3	11	Anticosti, G. of St. L...	29.06
III.....	6	32	105	49	65	4.5	24.1	16	Bird Rocks, G. of St. L.	29.34
IV.....	14	38	87	48	62	2.0	43.8	20	Sydney, C. B. I.....	29.60
V.....	18	41	87	47	60	1.5	41.7	27	Block Island, R. I.....	28.91
VI.....	24	29	76	47	61	5.0	15.0		Mean	29.31

*October. Average rate of progress, 34.1 miles per hour.

I.—The month opened with an extended area of low pressure covering the eastern slope of the Rocky Mountains with two centres of disturbance, one in Colorado and the other in southeastern Dakota, while areas of high pressure covered the Atlantic and Pacific coasts. During the 1st the two centres moved eastward, that from Colorado passing to eastern Kansas and the more northerly disturbance covering northern Michigan, with strong southerly winds and general rains in the Lake region and upper Mississippi valley. During the 2d the southern portion of the disturbance was replaced by the high area from the westward, while the northern centre of disturbance moved northeastward to the Saint Lawrence Valley, the pressure decreasing as the centre approached the coast.

II.—Number ii was observed previous to the development of the disturbance traced as number i. A slight disturbance appeared in the Missouri Valley, and was apparently forced southward by an increase of pressure to the north. On the afternoon of the 4th a disturbance of slight energy appeared in southern Colorado with general snows in Wyoming, Colorado, and Utah. This disturbance moved rapidly to the northeastward with increasing energy and was followed by a sharp fall of temperature in the central valleys. The area of rain which attended this depression generally included the Northern States and portions of Kentucky, Tennessee, and Arkansas. It passed northeastward over the Lake region north of the Saint Lawrence River, and was last observed as central near the west coast of Newfoundland on the morning of the 7th.

III.—Number iii was probably central in western Texas on the afternoon of the 6th, when the barometric pressure was low over the entire Rocky Mountain region, and a well-defined depression covered Montana. During the following day the northern disturbance was replaced by an area of high pressure over the northern and central Rocky Mountain regions, while the southern disturbance moved eastward, attended by very heavy rains in the Gulf States and as far northward as Missouri. After reaching eastern Texas the direction changed to the northeast, and the centre of disturbance reached the lower Ohio valley on the afternoon of the 8th. Heavy rains continued in the central valleys during the 8th and 9th, and a cold wave extended over the eastern slope of the Rocky Mountains, causing heavy snows in eastern Kansas and freezing weather as far south as central Texas. The centre of disturbance was apparently retarded and drawn to the westward from the afternoon of the 8th until 8 a. m. of the 9th, and during the succeeding twelve hours it moved slowly northward. It was central in the valley of the Wabash on the afternoon of the 8th, and north of, and near, Saint Louis, on the morning of the 9th, and south of, and near, Davenport, Iowa, on the afternoon of the 9th, after which it moved northward over the Lake region and disappeared in the lower Saint Lawrence valley on the afternoon of the 11th. The storm increased in energy as it moved eastward, severe westerly gales occurring on the north Atlantic coast and in the Maritime Provinces as the centre passed to the eastward. The westerly gales continued in the Maritime Provinces until the 13th, but the centre of disturbance had passed to the eastward on the preceding day.

IV.—This area of low pressure was apparently central in the east Gulf, near Pensacola, Fla., on the morning of the 14th. It moved northeastward over the south Atlantic states, developing considerable energy along the coast, attended by heavy rains and severe gales during the 14th. These rains continued and extended along the entire coast as far north as Nova Scotia, and the storm attained its maximum energy while central near the coast of Massachusetts. It extended in area and became less severe while passing over the Maritime Provinces, although the minimum pressure, 29.34, was observed at Bird Rocks on the 16th, when the centre was near that station.

V.—This storm developed in the southern part of the upper lake region, where the pressure was relatively low, although the barometer read 30.18 in the region where the disturbance originated, and the pressure was below 30.00 in southern Texas at the same time. It passed eastward over the lower lake region and New England, the pressure decreasing .20. It was central on the coast of Maine on the afternoon of the 19th, the pressure at the centre being 30.00, while on the morning of the 20th it was located near Sydney, where the pressure had decreased from 30.34 to 29.60 in twelve hours. This rapid decrease of pressure over Nova Scotia and an increase of pressure along the New England coast during the same period was attended by strong northeasterly gales. This storm moved rapidly to the northeast after leaving the coast line and is traced as ocean storm number 9.

VI.—This low area caused along the middle Atlantic and New England coasts a succession of violent gales, which were not only the most severe of the month, but also among the most

notable in the records of the past eighteen years. The depression was a West Indies hurricane, of that type or class which spends itself over the ocean without passing over the land area of the United States. Hurricanes of this class are especially dangerous to shipping plying along the Atlantic coast, since these storms approach the coast from the southeastward, their coming heralded at first only by a slight decrease of barometric pressure along the immediate coast line. When stations of observations were maintained in the greater and lesser Antilles, the Signal Service had timely warning of the advent of these storms, but since the discontinuance of these important stations, the Service is left scant time in which to issue warnings after the first storm indications are detected. The marine reports between the 18th and 22d indicate that this disturbance existed as a West Indies hurricane, moving directly westward to the south of, and near, the 25th parallel, between the sixtieth and seventy-seventh meridians, west of Greenwich. Near the seventy-seventh meridian the course of movement changed to the northward, and during the 23d and 24th the regular telegraphic weather reports of the Signal Service suggested the presence of a severe storm off the coast of Florida. Although the centre of this storm passed northward, nearly parallel to, and about two hundred miles east of, the middle and south Atlantic coasts, until it reached the vicinity of Nantucket, Mass., timely warnings were issued to the coast stations. These warnings were based upon observations taken on the extreme western edge of the low area at stations within the limits of the United States, but the indications were of so feeble and uncertain character that, without the wide experience of the Indications Officer in dealing with storms of this class in previous years, they would have been neglected and unheeded.

Cautionary signals were displayed at the southern New England ports at 9.40 p. m. of the 23d, at which time they were changed from storm to cautionary owing to the dying out of a previous storm resulting from a high area to the northward, and they were continued as cautionary on the southern New England coast on account of the threatening conditions on the south Atlantic coast at that time. At 11.45 a. m. of the 24th cautionary northeast signals were changed to storm northeast on the North Carolina coast, and cautionary northeast hoisted at Norfolk, and the following message sent: "Brisk to high northeast winds indicated for the North Carolina coast." The storm was then apparently central some distance to the east of Florida. At 9.45 p. m. of the 24th cautionary northeast were changed to storm northeast at Narragansett section, Wood's Holl, and Wood's Holl section, and cautionary northeast hoisted at New Haven, New London, Newport section, Boston, and Boston section, and Sandy Hook, and cautionary northwest at Atlantic City, Breakwater, and Fort Monroe. Messages: "Storm central south of Hatteras, apparently moving northeastward, strong northeast winds are indicated for the southern New England coast." "Brisk to high northerly winds for the middle Atlantic coast." When these signals were ordered the winds were light on the New England coast from Boston northward. At 10.20 a. m. of the 25th cautionary northeast were changed to storm northeast at Boston, Boston section, and Sandy Hook. Message: "Storm central southeast of New England and off the middle Atlantic coast, moving northeast. Dangerous gales are indicated for the middle Atlantic and New England coasts to-day or to-night."

From the above it will be seen that New England was warned while the storm was central near the southern Florida coast. The accompanying charts show the position of the storm centre at 8 a. m., Washington time, from the 23d to the 28th, inclusive, and the accompanying extracts from the reports of Signal Service observers and marine reporters serve to show the severity of the storm and the loss of life and property. These reports indicate that the storm apparently attained its maximum energy when the centre was south of New England and east of New Jersey, and they also indicate that the storm centre moved slowly to the northward after reaching the latitude of Hatteras, N. C., increasing in energy until it passed the southern New England coast, when it filled up rapidly. It apparently changed direction to the eastward, and by the 29th it existed as a feeble disturbance north of Nova Scotia. The intensity of the storm was apparently increased by the advance of an area of decidedly high pressure over the Saint Lawrence Valley immediately to the north of the disturbance. This area of high pressure was moving slightly to the south of east in rear of an extended area of low pressure in the north Atlantic. The barometer continued to rise in the lower Saint Lawrence valley until the afternoon of the 25th, reaching 30.80 when this storm was central east of Norfolk, Va. The centre of the area of high pressure passed to the northeast of the storm centre, causing an unusual gradient in the northern quadrants of the storm which resulted in destructive gales, these gales continuing until the centre of disturbance reached the land, when, as is usually the case, the intensity of the storm diminished.

The following are abstracts of reports made by Signal Service observers relative to this storm:

Hatteras, N. C., 25th: the high wind which prevailed throughout the day attained a maximum velocity of sixty-six miles per hour from the north at 6.10 a. m. The gale caused some damage to shipping.

Norfolk, Va., 25–26th: a storm began on the 25th and continued throughout the following day; the maximum velocity of wind, fifty miles per hour from the northwest, occurring at 6.55 p. m., 26th. The storm was very destructive; telegraph lines were prostrated, vessels blown from their moorings, and much damage to other property resulted. The tide was very high, flooding the lower portion of the city.

Kitty Hawk, N. C., 24th: a severe northeast storm has continued without cessation since 7 a. m. of the 20th. The wind continued in northeast until 3 p. m. to-day, when it backed to the north and increased in force, blowing steadily at about sixty miles per hour.

Atlantic City, N. J., 26th: high northwest wind; barometer very low, falling to 28.96 at 2 p. m.; high tide caused much damage.

New York City, 25–26th: high northwest winds prevailed throughout the 25th and 26th; maximum velocity forty miles per hour, on the 26th. Numerous houses along the coast were carried away by the wind, and hotels were flooded. The Coney Island railway was seriously damaged by washouts. The damage in this vicinity will amount to millions of dollars.

New Haven, Conn., 25–27th: a northeasterly gale began at 12.30 a. m., 25th, and continued until noon of the 27th, attaining a maximum velocity of fifty-one miles per hour from the northeast at 10.20 p. m., 25th, the highest velocity ever recorded at this station; snow began at 8.40 a. m., and changed to sleet at 4.10 p. m., 25th, and changed to rain during the night following. The storm caused much damage to property; two houses were blown over, and the telephone and telegraph wires sustained severe injury.

Block Island, R. I., 24–27th: the storm which began at 6.30 a. m., 24th, continued until 11.50 a. m., 27th; maximum velocity, eighty-four miles per hour, occurred at 3.25 a. m., 26th. The storm was very destructive to telegraph lines, and caused some damage to shipping. The barometer reached a minimum of 28.91 at about noon, 27th.

Vineyard Haven, Mass., 24–27th: high easterly and northeasterly winds, accompained by heavy rains, at intervals, prevailed from 8 p. m., 24th, until 6.30 p. m., 27th. All boats in the harbor dragged anchors; smaller craft were torn from their moorings and driven ashore, and numerous wrecks are reported.

Wood's Holl, Mass., 25–27th: high northeasterly winds began at 8 p. m., 25th, and continued until the evening of the 27th; maximum velocity, forty-eight miles per hour, occurred at 2 p. m., 27th. Heavy rain fell at intervals. The telegraph wires sustained some injury.

Portland, Me., 25–27th: high northeasterly winds, accom-

panied by snow, sleet, and rain, prevailed during the 25th, 26th, and 27th; maximum velocity of wind, thirty-six miles per hour from the northeast, on the 26th.

Eastport, Me., 25–27th: high northeasterly winds began on the 25th and ended at 4.45 a. m., 27th, attaining a maximum velocity of sixty-four miles per hour from the northeast; the gale was accompanied by snow, sleet, and heavy rain; much damage was caused to fences and buildings.

Boston, Mass., 25–27th: the barometer fell steadily during the 25th, reading 29.88 at 8 p. m.; snow fell during a greater part of the day, changing to rain in the morning and evening. The wind at 8 a. m. was blowing twenty-eight miles per hour from the northeast, and had been as high as thirty-eight miles per hour from the northeast during the preceding night. From 8 a. m. it increased gradually in velocity to forty-two miles, and continued to blow from thirty-six to forty-two miles from the north and northeast throughout the day and evening. The local weather conditions were almost identical with those of the "great blizzard" of March 11–13th, 1888. On the 26th the barometer fell slowly to 29.45 at 8 p. m. The wind blew in violent gales all night, the maximum velocity being sixty miles from the northeast at 1.35 a. m. It then moderated slightly, and at 8 a. m. was blowing thirty-six miles from the northeast, after which it again increased and blew heavy gales all day, with a maximum velocity of forty-eight miles from the northeast and north. After 8 p. m. it moderated. Dense fog hung over the harbor at night, and the afternoon steamers delayed sailing on account of the violence of the storm and the thick weather.

The following reports by shipmasters refer to this storm: *

17th.—Captain Metzenthin, of the s. s. "Ascania," reports a storm from the 16th to 18th; wind shifted from ne. to sse.; highest force of wind, 11 to 12; lowest barometer, 29.81, at 4 p. m. of the 17th, in N. 25° 1′, W. 57° 46′.

20th.—Capt. S. de Felleria, of the s. s. "Auskaro," reports a gale during the 19th and 20th; wind shifted from ene. to nne. and n.; highest force of wind, 8; lowest barometer, 29.56, at 3.30 a. m. of the 20th, in N. 26° 45′, W. 66° 07′. Captain Spratly, of the s. s. "Mozart," reports a storm from the 17th to the 25th; wind shifted from nnw. to ne.; highest force, 10 to 11; lowest barometer, 29.75, at noon of the 20th, in N. 28° 28′, W. 67° 08′.

21st–22d.—Captain Catherine, of the s. s. "City of Augusta," reports a strong gale from ne. to n.; lowest barometer, 29.97, at 5 a. m. of the 20th, in N. 36° 20′, W. 75° 00′.

22d.—Captain Barber, of the s. s. "Tropic," reports a nnw. gale, of hurricane force, on the 22d; lowest barometer, 29.94, at noon, in N. 26° 6′, W. 80° 7′.

23d.—Captain Pearson, of the s. s. "Fort William," reports a whole n. to nw. gale on the 23d; lowest barometer, 29.71, at noon, in N. 27° 20′, 79° 25′. Captain Norton, of the s. s. "Fanita," reports a n. gale of hurricane force; lowest barometer, 29.55, at 7.50 p. m., off Frying Pan Shoals. Captain Henderson, of the s. s. "Colon," reports a violent gale, attaining force 11 on the 23d, on which date the lowest barometer, 29.40, occurred at 6 a. m., in N. 30° 06′, W. 74° 10′.

24th.—Captain Wallace, of the bk. "Monsita," reports a gale, attaining force 11, at noon of the 24th, in N. 32° 14′, W. 75° 29′; direction of wind at time of maximum velocity, wsw. Captain Stevens, of the s. s. "Manhattan," reports a gale attaining force 9 on the 24th; wind shifted from ne. to n.; lowest barometer, 29.94, at noon, in N. 29° 45′, W. 80° 22′. The gale commenced the day after leaving New York, November 22d, and lasted until noon of the 25th. The wind seemed to follow the trend of the coast from Hatteras to Jupiter, as it was dead aft all the time, blowing seventy-five or eighty miles per hour at times, with a very heavy, breaking sea, especially off Frying Pan and Romaine.

25th.—Captain Wilder, of the s. s. "City of San Antonio," reports a wnw. gale of force 10; lowest barometer, 29.06, at 5 p. m., in N. 36° 46′, W. 73° 54′. Captain Wass, of the schr. "Morancy," reports a nw. storm of force 11; lowest barometer, 29.01, at midnight, in N. 37° 27′, W. 73° 39′. Captain Boaz, of the s. s. "Wyanoke," reports a nne. storm on the 25th; lowest barometer, 28.96, at 4 p. m., off Hog Island, Va. Captain Daggett, of the s. s. "Chattahooche," reports a n. storm; lowest barometer, 29.11, at 4 a. m., twenty-five miles ene. from Cape Henry.

26th.—Captain Crosby, of the s. s. "Effective," reports: noon, in N. 38° 35′ W. 71° 49′, 1 a. m., wind ne., barometer, 28.80, strong gale and high increasing sea; 5 a. m., very heavy gale, ship headed bow to sea; noon, wind e., hard gale, barometer, 28.60; 5 p. m., wind nne., hard revolving gale, barometer, 28.20; midnight, wind w., barometer, 28.20?. Captain Le Gallias, of the s. s. "Grecian," reports a nw. hurricane; lowest barometer, 28.74, at 9 a. m., in N. 38° 10′, W. 72° 45′. Captain McCarthy, of the pilot boat "J. F. Loubat," reports strong gales from the 23d to the 26th; lowest barometer, 28.80, at 10 a. m., of the 26th, in N. 38° 00′, W. 73° 50′. Captain Jenney, of the s. s. "Richmond," reports a nw. gale on the 26th; lowest barometer, 28.93, one hundred miles off Cape Henry. Capt. Andrew Jackson, of "Light Vessel No. 45," in N. 37° 57′, W. 75° 05′, reports a nnw. to nw. hurricane; lowest barometer, 29.42, at 5 p. m.

27th.—Captain Bussius, of the s. s. "Werra," reports a gale veering from ese. to s.; lowest barometer, 29.27, at 5 p. m., in N. 40° 33′, W. 71° 40′.

The following is a report by the Boston Chamber of Commerce, forwarded through the Signal Service observer at Boston, of vessels wrecked during this storm. The list does not include the names of vessels damaged or which went ashore and afterwards floated:

S. S. "Allentown." Barks "Alexander Campbell," "Hannah." Brigs "Wilhelmina," "Golconda," "Alice." Schooners "Amazon," "Abbie S. Emery," "Albert H. Cross," "Clara," "E. L. Higgins," "Elizabeth," "Ethel M. Davis," "Edward H. Norton" (fisherman), "Emma," "G. W. Rawley," "J. and J. Locke," "John Mettler" (fisherman), "Lena Breed," "Marshall O. Wells," "Nellie Florence" (fisherman), "Robert Dority," "Robert Ripley," "Sasanoa," "T. A. Lambert," "William McLean," "Mountain Fawn."

On chart vii will be found the tracks of the centres of some of the principal storms of similar character occurring between 1873 and 1888, which caused more or less damage to shipping of the United States, and which might, in a measure, have been prevented had this service had regular meteorological stations in the West Indies and Bermudas, and provision made for telegraphic communication with them during the stormy season. While a number of these storms passed along the Atlantic coast without producing severe gales at the coast stations, reliable reports from the Bermudas and West Indies might enable this service to warn vessels about to leave port of the existence of dangerous storms, and of their probable direction of movement. Two such storms occurred in August, 1887, one in August, 1886, and one in August, 1879. While the storms of August, 1881, and September, 1876, approached the south Atlantic coast from the West Indies they disappeared soon after their centres reached the continent.

Referring to the severe storm of August, 1873, which caused the loss of probably 600 lives and over 1,000 vessels, involving losses aggregating $3,500,000, and seriously crippling the fishing interests of the United States and Canada, the English Meteorological Office, in a report covering a history of this storm, states that "its existence was known on the 18th at Saint Thomas, a week before the damage was done on the American coast, and on the 21st the residents of Bermuda were fully aware of its existence and could have foretold its track. From both of these places warnings might have been sent to America if telegraphic communication had existed."

In August, 1886, a storm appeared to the eastward of the Barbadoes on the 15th, and thence passed westward over the Carribbean Sea to about N. 14°, W. 76°, and during the 22d passed northward over Cuba, in about W. 81°; it then moved northeastward along the course of the Gulf Stream to New-

*In reports of shipmasters, force of wind is given on scale of 0 to 12 (Beaufort scale).

foundland by the 28th. This storm was particularly severe, causing loss of life and destroying crops and property of immense aggregate value.

In August, 1887, two severe storms advanced northward from the West Indies. One apparently originated to the eastward of the Windward Islands and moved northwestward to about N. 22°, W. 63°, by the 16th; moving slightly north of west, the depression was central on the 19th off the east coast of southern Florida, whence it recurved northward and followed the course of the Gulf Stream until the 23d, on which date it was central in N. 50°, W. 31°. During the passage of this storm along the coast of the United States it was attended by hurricanes of exceptional violence. During this month the presence of a second storm was indicated to the eastward of the Windward Islands on the 19th; by the 20th the centre of depression had moved west-northwest to about N. 22°, W. 66°, whence it is traced to N. 26°, W. 76°, by the 21st. On this date south to west gales of hurricane force prevailed over the eastern portion of the Bahama Islands; in the vicinity of the thirtieth parallel fresh easterly gales were reported, while off the Florida coast strong northerly gales prevailed. During the 22d and 23d the storm recurved slowly northward, with a marked decrease in energy; by the 24th it had advanced to N. 32°, W. 76°, and during its northeast passage along the course of the Gulf Stream during the next two days it was attended by hurricanes of great violence.

By extending telegraphic communication with Bermuda and availing ourselves of that now existing in the West Indies it would become possible for this Service to greatly extend its usefulness to the shipping interests of the country, and with proper arrangements for the distribution of storm signals, warnings could be issued which in a single year might save from destruction property the value of which would exceed the cost of maintaining this Service for many years.

NORTH ATLANTIC STORMS FOR NOVEMBER, 1888 (pressure in inches and millimetres; wind-force by Beaufort scale).

The paths of the depressions that appeared over the north Atlantic Ocean during November, 1888, are shown on chart i. These paths have been determined from international simultaneous observations by captains of ocean steamships and sailing vessels, received through the co-operation of the Hydrographic Office, Navy Department, and the "New York Herald Weather Service."

Eleven depressions have been traced, of which six advanced north of east over or near Newfoundland; two first appeared northeast of the Windward Islands; and three apparently originated over mid-ocean near the fiftieth parallel. The depressions traced north of the forty-fifth parallel generally followed normal east-northeast to northeast tracks, the exceptions being numbers 1 and 6, which assumed southerly paths after having advanced to the vicinity of the thirtieth meridian. An important storm which moved westward north of the West Indies to the Bahamas is thence traced northward off the coast of the United States as a low area. A second storm of tropical origin moved from northeast of the Windward Islands and apparently dissipated west of the Azores. The severest disturbances of the month occurred over mid-ocean, from the 6th to the 12th, inclusive, attending depressions 2, 3, and 5, and off the coast of the United States from the 21st to the 27th, attending depression 8 (low area vi).

In November, 1887, fourteen depressions were traced, of which two were continuations of storms charted for October, 1887; three traversed the ocean from coast to coast; one first appeared east of the fifteenth meridian; five passed eastward over or to the northward of Newfoundland; one apparently originated south of Nova Scotia; and three were given probable paths northward from the sub-tropical region. The general direction of movement of the depressions was east-northeast, and their tracks were rather evenly distributed along and north of the trans-Atlantic routes.

In November, 1888, the depressions traced corresponded in number with the average for November during the past four years. Over mid-ocean along the trans-Atlantic routes the weather was generally stormy, except during the latter half of the third decade. In the vicinity of the British Isles there was a succession of heavy gales during the first half of the month, and from the 24th to the 30th, inclusive; while off the coast of the United States the month was characterized by the very destructive storms of the third decade. Considered as a whole, the weather over the north Atlantic during the month was seasonable, and the depressions, while possessing great energy, did not exceed in intensity those traced for November during preceding years.

In the following descriptions of the depressions traced positions are given in degrees, latitude and longitude, except in cases where from twenty-five to thirty-five minutes have been cited, when they are given in degrees and half degrees.

1.—This depression was apparently a continuation of number 11, traced for October, 1888, and was central on the 1st south of Greenland near the fifty-fifth parallel, whence it moved northeast to the thirtieth meridian by the 2d, where it assumed a southeast course and advanced to the southern extremity of Ireland by the 4th, after which it passed eastward over the continent of Europe. This depression was attended by moderate gales and exhibited lowest pressure on the 3d, when a reading of 29.44 (747.8) was reported at noon, Greenwich time.

2.—This depression was central over Newfoundland on the 4th, from whence it moved rapidly eastward, and is last located south of the British Isles under date of the 8th. This storm was attended throughout by fresh to strong gales, and closely followed the trans-Atlantic steamer routes over a greater part of the ocean. Subsequent to the 8th the storm centre apparently recurved to the northward under the influence of depression number 3 which occupied mid-ocean during the 8th and 9th.

3.—This depression (low area ii) passed along the southern coast of Newfoundland during the 7th, and by the 8th had advanced to about N. 52°, W. 40°, and thence moved northeast to the thirtieth meridian by the 10th, after which it disappeared north of the region of observation. This storm augmented in energy during its advance over the ocean, and on the 9th barometer readings ranging to 28.41 (721.6) were reported near its centre, and from the 8th to 10th, inclusive, gales attaining hurricane force were encountered over mid-ocean.

4.—This depression is first charted northeast of the Windward Islands under date of the 5th, and is thence traced northeast to about N. 35°, W. 45° by noon, Greenwich time, of the 8th, after which its course cannot be determined with reports at hand. The storm possessed great energy, and its advance was attended by violent gales.

5.—This depression was apparently a subsidiary development to depression number 3, and is first located in about N. 49°, W. 22°, under date of the 11th, when strong to whole gales and pressure falling below 29.00 (737) were reported. By the 12th the storm-centre had advanced to the westward of the British Isles, where minimum pressure falling below 28.50 (724), and strong to whole gales, were reported. Subsequent to the 12th the depression apparently recurved to the northward under the influence of depression number 6, which occupied the ocean to the westward.

6.—This depression (low area iii) advanced from the Gulf of Saint Lawrence over northern Newfoundland and at noon, Greenwich time, of the 12th was central in about N. 52°, W. 43°, and from thence moved east-northeast to the thirty-second meridian by the 13th, where it remained nearly sta-

tionary until the 14th, when it recurved southward to the fifty second parallel, where it was central on the 15th. By the 16th the storm-centre had moved northeast to the fifty-sixth parallel, after which it disappeared north of the region of observation. This storm increased in energy as it advanced eastward, and from the 12th to the 15th, inclusive, occasioned strong to whole gales over mid-ocean along the trans-Atlantic routes.

7.—This depression (low area iv) was central on the morning of the 17th off the southern coast of Newfoundland, without evidence of marked energy, from which locality it passed northeast and disappeared north of the fiftieth parallel.

8.—This storm (number vi) was a hurricane of tropical origin. It is first located northeast of the Windward Islands under date of the 17th; from this position it is given an approximate path westward to the Bahama Islands, where it arrived on the 22d; during that and the following date the storm-centre recurved slowly to the northward, and, pursuing an abnormal northerly course, advanced to the south New England coast by the night of the 25–26th, after which it moved slowly along the New England coast, over eastern Maine, New Brunswick, and the southern part of the Gulf of Saint Lawrence to the vicinity of Cape Race, N. F., by the 30th. This storm was attended by very destructive gales off the coast of the United States from the 21st to the 27th, inclusive. On the 22d its influence extended to the fortieth parallel, and after its recurve over the Bahama Islands it augmented in energy until the 26th, when minimum pressure falling below 29.00 (737.0) was reported, after which there was a marked diminution in strength until the 30th, when the depression exhibited small energy. Storms of this class at this season generally follow the trend of the Gulf Stream after recurving to the northward. In the present instance the abnormal westerly movement may possibly be due to the very high barometric pressure which prevailed over and south of Newfoundland during the advance of the storm northward from the Bahamas. On the 26th there was a gradient of about two inches between the storm-centre's position and southern Newfoundland; subsequent to which date the storm gradually lost energy and a marked decrease in pressure occurred over and near Newfoundland. The conditions attending the unusual course of this storm give color to the belief that a storm's course is largely governed by the movements and position of areas of high pressure. Some of the most destructive storms noted along the Atlantic coast of the United States have appeared as depressions deflected westward to, or near, the coast by some undefined cause, which possibly may have been areas of high pressure located over, and south of, Newfoundland.

9.—This depression (low area v) moved rapidly northeastward from the Gulf of Saint Lawrence, where it was central on the 20th, to about N. 56°, W. 38° by the 21st, after which it advanced slowly east-northeast and disappeared in the vicinity of the twentieth meridian after the 23d, attended until the 22d, inclusive, by strong to whole gales.

10.—This depression first appeared over mid-ocean on the 23d, and was, apparently, a subsidiary development of depression number 9. Moving east-northeast the centre of depression disappeared north of the British Isles after the 25th, its passage being attended by strong to whole gales.

11.—This depression was apparently central about ten degrees west of the British Isles on the 26th, and by the 28th had advanced to the southwest extremity of Ireland, after which it probably recurved northward. This storm, in connection with number 10, caused low pressure to prevail over the British Isles during the last seven days of the month, and occasioned fresh to strong gales westward over the ocean to the fortieth meridian.

OCEAN ICE IN NOVEMBER.

No ice was reported during the month. In 1882, 1883, and 1887, none was reported. In 1886, only one berg, fifty to sixty feet high, was observed on the 2d in N. 45° 20′, W. 45° 26′. In 1885, the only iceberg reported was observed in N. 48°, W. 51° 10′. In 1884, several icebergs were seen in N. 45° 56′, W. 52° 38′.

FOG IN NOVEMBER.

The limits of fog-belts to the westward of the fortieth meridian are shown on chart i by dotted shading. In the vicinity of the Banks of Newfoundland no fog was reported until the 17th, after which it occurred on six days; for October, 1888, it was reported on eleven days, and for November, 1887, fourteen days. Between the fifty-fifth and sixty-fifth meridians fog was reported for a total of seven days as compared with two days for October, 1888, and three days for November, 1887. To the westward of the sixty-fifth meridian fog was reported on seven days as compared with five days for October, 1888, and three days for November, 1887. From the above it will be seen that when compared with November, 1887, there was a marked deficiency in the number of fog-banks reported near Newfoundland, while to the southward of Nova Scotia and off the coast of the United States there was a decided increase in the number of days on which fog was reported.

As compared with the chart of the preceding month slight changes are shown in the southern limits of the fog-belts, while in November, 1887, fog was reported about one degree farther south in the vicinity of the Grand Banks than in the corresponding month of 1888.

On the several days for which fog was reported near Newfoundland the presence of an area of low pressure was shown to the west or northwest, except on the 18th when fog was encountered with variable winds and rising barometer following the passage to the northward of a storm-centre. Between the fifty-fifth and sixty-fifth meridians the development of fog attended the passage to the northward of areas of low pressure. Off the coast of the United States fog followed the passage of areas of low pressure eastward over the Gulf of Saint Lawrence, except during the 9th and 10th, when a depression of considerable strength advanced from the Mississippi Valley to the Saint Lawrence Valley, and on the 15th and 26th, when depressions were central off the middle Atlantic coast.

The following are limits of fog-areas on the north Atlantic Ocean during November, 1888, as reported by shipmasters:

Date.	Entered.		Cleared.		Date.	Entered.		Cleared.	
	Lat. N.	Lon. W.	Lat. N.	Lon. W.		Lat. N.	Lon. W.	Lat. N.	Lon. W.
	° ′	° ′	° ′	° ′		° ′	° ′	° ′	° ′
3	49 00	62 20	49 27	60 50	20	47 16	47 00	46 46	48 33
6	36 57	75 50	36 57	75 50	20	44 55	49 05	44 12	53 00
6	Sandy Hook.		Off Barnegat.		21	42 50	60 58	42 40	62 10
6	40 37	72 00	Sandy Hook.		26	40 44	67 31	40 32	68 15
7	42 36	65 24	42 35	66 06	27–28	46 08	55 11	45 30	58 25
7	36 00	75 00	36 50	74 45	28	43 57	52 44	43 27	56 05
9–10	40 45	68 43	40 26	73 50	27–29	46 00	54 00	42 40	60 00
10	Nantucket Shoals		Sandy Hook.		28–29	46 30	47 36	44 07	57 10
15–16	40 35	69 30	40 28	69 16	28–29	45 22	52 38	43 30	58 57
16	42 36	66 52	42 34	67 04	28–29	44 00	53 00	43 00	60 00
16–17	42 49	60 18	42 37	63 23	28–29	46 05	52 50	45 05	60 08
17	44 58	53 06	44 48	54 04	28–30	Dense fog at St. John's, N. F.			
17	Off south coast of Newfoundland.				29–30	45 00	48 30	43 00	53 00
17–18	47 34	50 20	48 30	43 50	29	44 14	56 00	43 40	58 07

TEMPERATURE OF THE AIR (expressed in degrees, Fahrenheit).

The distribution of mean temperature over the United States and Canada for November, 1888, is exhibited on chart ii by dotted isotherms. In the table of miscellaneous meteorological data the monthly mean temperatures and the departures from the normal are given for stations of the Signal Service. The figures opposite the names of the geographical districts in the columns for

mean temperature show the averages for the several districts. The normal for any district may be found by adding the departure to the current mean when the departure is below the normal and subtracting when above. Chart iii exhibits normal and current November temperature curves for selected stations.

The mean temperature was highest over southern Florida, where 74°.7 was reported at Key West. Over southern California and southwestern Arizona, at points in the lower Sacramento and lower San Joaquin valleys, and along the coasts of Louisiana and Texas, the mean values rose above 60°. The lowest mean temperature occurred over a portion of southern Montana, northern Dakota, northeastern Montana, and at stations in the valley of the south Saskatchewan River, where it fell below 25°. The lowest mean, 22°.1, was noted at Minnedosa, N. W. Ter. From the upper Missouri valley southward over central Colorado, and eastward north of the forty-fifth parallel to the Gulf of Saint Lawrence, the mean temperature was generally below 32°, except over the upper lake region and in eastern New Brunswick and Nova Scotia.

The mean temperature corresponded with the normal over portions of Quebec, New Brunswick, New England, eastern New York, Florida, and along and near the coasts of South Carolina and Georgia, along lines traced over the lower and upper Missouri, lower Mississippi and Rio Grande valleys, at points in the Rocky Mountain regions, on the north Pacific coast, and in the vicinity of Keeler, Cal. The greatest departures above the normal occurred in Manitoba, where they exceeded 7°, from which province they become gradually less marked southeastward to the middle Atlantic and middle Gulf coasts. The mean temperature was also above the normal in the middle plateau region of the Rocky Mountains, and along the Pacific coast south of the forty-fifth parallel. The departures below the normal were most marked in the northern and southeastern Rocky Mountain slopes, where they amounted to more than 6° in the former and 5° in the latter region. The mean temperature was also below the normal over portions of New England and eastern New York and in the lower Saint Lawrence valley, along the south Atlantic coast, in Florida, parts of New Mexico and Arizona, in the valley of the Columbia River, and on the north Pacific coast, the departures being generally small.

The following are some of the most marked departures from the normal at the older established Signal Service stations:

Above normal.	°	Below normal.	°
Duluth, Minn.	5.2	Fort Custer, Mont	6.5
Saint Vincent, Minn.	5.0	Helena, Mont.	6.3
Port Huron, Mich.	4.8	Abilene, Tex.	5.0
Chattanooga, Tenn.	4.0	Fort Smith, Ark	3.2
Milwaukee, Wis.	3.6	Lamar, Mo.	3.0

DEVIATIONS FROM NORMAL TEMPERATURES.

The following table shows for certain stations, as reported by voluntary observers, (1) the normal temperature for a series of years; (2) the length of record during which the observations have been taken, and from which the normal has been computed; (3) the mean temperature for November, 1888; (4) the departure of the current month from the normal; (5) and the extreme monthly means for November during the period of observation and the years of occurrence:

State and Station.	County.	(1) Normal for the month of Nov.	(2) Length of record.	(3) Mean for Nov., 1888.	(4) Departure from normal.	(5) Extreme monthly mean temperature for November.			
						Highest.	Year.	Lowest.	Year.
Arkansas.		°	Years	°	°	°		°	
Lead Hill	Boone	47.5	7	45.2	−2.3	50.0	1883	45.2	1885 '88
California.									
Sacramento	Sacramento	51.0	23	48.8	−2.2	57.0	1875	44.7	1880
Colorado.									
Fort Lyon	Bent	36.8	19	37.8	+1.0	44.6	1867	19.6	1880
Dakota.									
Fort Randall	Todd	33.2	26	35.2	+2.0	43.0	1870	22.8	1880
Florida.									
Merritt's Island	Brevard	66.1	5	67.9	+1.8	69.2	1884	59.9	1885
Georgia.									
Forsyth	Monroe	55.9	14	56.9	+1.0	59.0	1874	51.0	1880
Illinois.									
Golconda	Pope	46.3	11	47.7	+1.4	50.2	1878	34.6	1880
Peoria	Peoria	39.6	33	41.9	+2.3	*42.8	1878 '85	*30.2	1880
Riley	McHenry	33.1	28	37.1	+4.0	*37.1	1888	*24.1	1880
Indiana.									
Logansport	Cass	40.0	34	42.6	+2.6	†43.3	1881	†29.5	1880
Vevay	Switzerland	43.7	21	46.8	+3.1	53.8	1883	35.3	1880
Iowa.									
Cresco	Howard	28.9	14	32.8	+3.9	34.7	1878	19.2	1880
Monticello	Jones	33.4	35	36.9	+3.5	41.5	1859	25.0	1858
Logan	Harrison	35.6	14	38.8	+3.2	41.2	1878	27.5	1880
Kansas.									
Lawrence	Douglas	40.5	13	39.2	−1.3	45.9	1878	31.6	1880
Wellington	Sumner	41.5	9	40.6	−0.9	45.5	1879	29.0	1880
Louisiana.									
Grand Coteau	St. Landry	60.0	6	58.9	−1.1	63.9	1883	57.3	1884
Maine.									
Gardiner	Kennebec	35.8	52	36.4	+0.6	41.9	1849	26.4	1873
Maryland.									
Cumberland	Allegany	41.0	17	42.7	+1.7	45.0	1883 '85	35.0	1880
Massachusetts.									
Somerset	Bristol	39.4	18	44.4	+5.0	‡44.8	1885	33.0	1873
Newburyport	Essex	39.2	9	41.2	+2.0	41.5	1883	36.5	1880
Amherst	Hampshire	38.1	14	40.8	+2.7	41.9	1885	32.8	1875
Michigan.									
Thornville	Lapeer	37.4	13	39.3	+1.9	40.4	1885	29.0	1880
Kalamazoo	Kalamazoo	36.7	13	40.1	+3.4	41.0	1879	27.0	1880
Minnesota.									
Minneapolis	Hennepin	28.2	13	33.0	+4.8	36.0	1878	17.4	1880
Missouri.									
Oregon	Holt	37.4	6	40.0	+2.6	44.9	1878	28.8	1880
Montana.									
Fort Shaw	Lewis & Clarke	32.5	20	35.1	+2.6	43.3	1867	19.9	1871
New Hampshire.									
Hanover	Grafton	33.3	54	34.8	+1.5	41.6	1849	24.8	1873
New Jersey.									
South Orange	Essex	41.9	14	43.8	+1.9	44.5	1885	37.5	1880
Moorestown	Burlington	41.8	25	45.3	+3.5	45.3	1886	36.2	1873
New York.									
Palermo	Oswego	34.4	35	37.6	+3.2	41.9	1859	26.8	1878
Cooperstown	Otsego	34.7	34	37.7	+3.0	38.5	1876-77	26.8	1873
Ohio.									
Wauseon	Fulton	35.6	18	40.1	+4.5	40.3	1883	27.9	1880
Oregon.									
Albany	Linn	43.7	9	45.2	+1.5	47.4	1884	40.7	1880
Eola	Polk	42.8	18	43.7	+0.9	46.7	1877	40.4	1879
Pennsylvania.									
Dyberry	Wayne	34.7	21	37.6	+2.9	38.2	1878 '81	26.4	1873
Grampian Hills	Clearfield	34.9	24	37.8	+2.9	39.1	1877	28.3	1869
Wellsborough	Tioga	36.0	9	39.8	+1.8	44.4	1885	31.5	1880
South Carolina.									
Statesburgh	Sumter	53.5	8	53.5	0.0	55.9	1883	51.2	1882
Tennessee.									
Milan	Gibson	47.1	5	48.2	+1.1	49.1	1883	45.5	1884
Austin	Wilson	48.5	12	52.2	+3.7	54.5	1879	44.2	1876
Texas.									
New Ulm	Austin	59.2	16	57.1	−2.1	65.6	1879	49.6	1880
Fort Concho	Tom Green	53.9	16	53.1	−0.8	58.9	1879	43.4	1880
Vermont.									
Strafford	Orange	34.1	14	35.4	+1.3	39.3	1885	25.8	1875
Virginia.									
Bird's Nest	Northampt'n	49.4	19	50.1	+0.7	55.6	1881	41.9	1880
Wytheville	Wythe	42.1	24	45.1	+3.0	45.2	1881	36.0	1869
West Virginia.									
Helvetia	Randolph	40.4	11	42.6	+2.2	45.0	1883	34.4	1880
Washington.									
Fort Townsend	Jefferson	42.1	14	43.0	+0.9	47.3	1884	36.9	1879
Wisconsin.									1875
Madison	Dane	33.2	8	37.3	+4.1	37.3	1888	31.0	

Deviations from normal temperatures—Continued.

* For 13 years. † For 9 years. ‡ For 16 years.

The highest temperatures for the month were reported in the lower Rio Grande valley, where a reading of 90°.2 was noted at Rio Grande City, Tex. Over a greater part of the interior of Texas values above 85° were recorded. Over the balance of Texas, and thence northward into Kansas, and eastward over the southern part of the Gulf states and south Atlantic states, in Florida, southern Arizona, and Los Angeles, Cal., the maximum temperature rose above 80°. At Portland, Me., Sandusky and Cleveland, Ohio, Louisville, Ky., Indianapolis, Ind., Chicago, Ill., Grand Haven, Mich., Milwaukee, Wis., Dubuque and Des Moines, Iowa, Yankton, Dak., Dodge City, Kans., Fort Elliott, Tex., Fort Sill, Ind. T., New Orleans, La., and Mobile, Ala., the maximum temperatures were higher than for any preceding November during the periods of observation. The most notable deficiencies occurred in northern Minnesota, northeastern Montana, in the middle and southern Rocky

Mountain regions, and along the north Pacific slope, where, at stations, the maximum temperatures were 10°, or more, below the maximum values for the corresponding month of previous years.

The lowest temperatures occurred in Montana, where they fell to —11°.5 at Fort Custer; they were generally below zero over the central and eastern parts of Montana, northern Dakota, northern Minnesota, and the northern portions of New Hampshire and Vermont. The minimum temperatures fell below 32°, except in southeastern Virginia, the eastern part of the south Atlantic states, Florida, the southern part of the Gulf states, along the immediate Pacific coast of Oregon, over a greater part of California, and in southwestern Arizona. Unusually low temperatures have not been reported, and at a large majority of stations they were considerably above the lowest readings previously noted for November, notably in the central valleys and in the Rocky Mountain regions, where the minimum readings generally ranged from 20° to 30° above the November records of previous years.

Table of comparative maximum and minimum temperatures for November.

State or Territory.	Stations.	For 1888.		Since establishment of station.				Length of record.
		Max.	Min.	Max.	Year.	Min.	Year.	
		°	°	°		°		Yrs.
Alabama	Mobile	83.7	33.5	82.0	1879, 1883	25.2	1887	16
Do	Montgomery	81.5	29.7	83.0	1879, 1882	21.0	1872	17
Arizona	Whipple B'ks	64.5	24.0	75.0	1878, 1885	— 2.0	1886	13
Do	Fort Apache	71.0	19.0	77.0	1882	3.6	1886	10
Arkansas	Fort Smith	79.0	28.0	86.0	1882	17.0	1887	7
Do	Little Rock	81.2	32.0	83.0	1882	10.0	1880	10
California	San Francisco	74.3	47.0	78.0	1871	41.0	1880	18
Do	San Diego	75.2	46.5	85.0	1873	38.0	1881	16
Colorado	Denver	70.2	11.5	70.0	1876, 1879	—18.0	1877	17
Do	Montrose	57.2	16.9	69.0	1885	—18.5	1886	4
Connecticut	New Haven	67.1	10.8	71.5	1882	2.0	1875	16
Do	New London	65.0	13.6	72.0	1882	4.0	1875	17
Dakota	Fort Buford	53.5	1.2	68.5	1887	—29.0	1887	10
Do	Yankton	78.8	9.0	78.2	1887	—18.1	1887	16
Dis. of Columbia	Washington City	75.3	23.9	80.0	1879	12.5	1880	19
Florida	Jacksonville	83.3	38.5	84.0	1875, 1877	26.4	1887	18
Do	Key West	84.0	58.0	91.0	1876	52.0	1873	9
Georgia	Atlanta	77.0	28.4	80.5	1882	16.4	1887	11
Do	Savannah	80.8	36.6	82.0	1875	22.0	1872	18
Idaho	Boisé City	64.8	18.3	71.7	1887	5.6	1887	12
Illinois	Cairo	78.4	28.2	80.5	1882	7.0	1872	17
Do	Chicago	75.2	20.0	72.0	1874, 1882	— 2.0	1872	17
Indiana	Indianapolis	76.0	25.7	75.0	1879	— 5.0	1880	16
Indian Ter	Fort Sill	84.2	22.0	84.0	1885	— 4.0	1880	12
Iowa	Dubuque	72.0	16.5	71.5	1887	—12.0	1887	16
Do	Des Moines	75.0	15.0	73.4	1887	— 9.1	1887	11
Kansas	Dodge City	83.8	18.5	83.0	1875	—12.9	1887	15
Do	Leavenworth	78.8	22.3	80.3	1887	— 4.3	1887	18
Kentucky	Louisville	76.5	25.0	78.0	1879	4.5	1872	17
Louisiana	New Orleans	84.8	41.0	84.7	1885	31.5	1881	18
Do	Shreveport	84.2	33.5	86.0	1882	18.0	1880	16
Maine	Eastport	63.8	5.0	64.0	1882	—13.0	1875	16
Do	Portland	66.6	7.0	66.0	1882	— 6.0	1875	17
Maryland	Baltimore	74.5	25.0	78.0	1879	15.0	1880	17
Massachusetts	Boston	74.0	12.8	75.0	1876	— 2.0	1875	18
Michigan	Marquette	58.6	10.5	69.0	1886	— 9.0	1875	15
Do	Grand Haven	71.6	18.5	69.0	1874, 1886	0.0	1880	16
Minnesota	Saint Vincent	50.0	— 7.0	69.1	1887	—30.2	1887	9
Do	Saint Paul	65.7	6.0	73.6	1886	—24.5	1875	17
Mississippi	Vicksburg	81.3	35.3	84.8	1885	23.0	1877, 1880	17
Missouri	Saint Louis	79.0	28.5	82.0	1879	5.0	1872	18
Montana	Ft. Assinaboine	61.4	— 5.9	70.6	1887	—29.8	1887	9
Do	Helena	57.0	— 4.0	65.5	1887	—17.0	1880, 1881	9
Nebraska	North Platte	74.9	9.0	81.2	1887	—25.2	1887	15
Do	Omaha	77.6	17.2	79.6	1887	—13.6	1887	16
Nevada	Winnemucca	63.7	4.0	71.3	1887	— 9.0	1880	10
New Jersey	Atlantic City	69.0	26.0	72.0	1882	10.0	1875	15
New Mexico	Santa Fé	64.1	12.0	77.0	1878	—11.0	1880	16
New York	Buffalo	67.9	15.0	68.3	1881	2.5	1875	16
Do	New York City	72.3	18.0	74.0	1882	7.0	1875	19
North Carolina	Charlotte	78.0	30.0	80.0	1879	18.0	1880	11
Do	Wilmington	79.3	35.8	83.0	1877, 1879	20.0	1872	18
Ohio	Cincinnati	76.4	26.8	75.0	1879	5.0	1880	19
Do	Sandusky	76.0	24.9	75.0	1879	0.0	1880	12
Oregon	Portland	58.3	31.0	68.0	1873, 1887	22.5	1880	16
Do	Roseburgh	62.0	30.6	69.7	1884	17.5	1880	12
Pennsylvania	Pittsburgh	74.3	24.0	79.0	1876	4.0	1880	16
Do	Philadelphia	75.0	18.0	77.0	1876	8.0	1875	18
Rhode Island	Block Island	64.4	21.0	70.0	1881	19.0	1880	9
South Carolina	Charleston	79.8	36.4	82.0	1879	28.0	1873	16
Tennessee	Knoxville	76.9	26.3	80.5	1881	11.5	1872	18
Do	Memphis	78.2	31.4	82.0	1879	16.0	1877, 1880	16
Texas	Brownsville	87.4	44.0	89.0	1882	30.0	1880	13
Do	Fort Elliott	84.2	22.2	83.4	1885	— 5.4	1887	9
Utah	Salt Lake City	63.1	25.7	70.0	1882	3.0	1880	15
Virginia	Lynchburgh	76.5	25.7	80.2	1882	13.0	1880	16
Do	Norfolk	79.0	33.0	80.0	1879	20.0	1872	18
Washington	Spokane Falls	54.5	15.2	60.0	1885	3.0	1881	8
Do	Olympia	55.0	24.0	63.0	1884	19.8	1887	12
Wisconsin	La Crosse	68.9	8.9	70.0	1874	—21.0	1875	17
Do	Milwaukee	70.5	14.0	70.0	1874, 1882	— 5.0	1880	19
Wyoming	Cheyenne	62.0	7.0	70.1	1887	—20.0	1875	16

RANGES OF TEMPERATURE.

The monthly and the greatest and least daily ranges of temperature at Signal Service stations are given in the table of miscellaneous meteorological data. The greatest monthly ranges occurred in the northern Rocky Mountain slope, middle Missouri valley, and northern Vermont, where at stations they exceeded 70°. Over a greater part of western New England north of Connecticut and Rhode Island, over portions of the upper Mississippi and middle Missouri valleys, and in parts of the northern, middle, eastern, and southeastern Rocky Mountain slopes they exceed 60°. They were least over the southeastern part of Washington Territory, where a range of less than 20° was reported, and over the southern extremity of Florida, where they were less than 30°. Over the east-central portion of the country they averaged about 50°; in the plateau regions of the Rocky Mountain, they varied from 37°.4 at Salt Lake City, Utah, to 59°.7 at Winnemucca, Nev.; along the immediate Pacific coast they fell below 30°, except at Eureka and Los Angeles, Cal., where they amounted to 35°.6 and 43°.8, repectively.

The following are some of the extreme monthly ranges:

Greatest.	°	Least.	°
Fort Custer, Mont	75.2	Fort Canby, Wash	19.3
Fort Laramie, Wyo	75.0	Astoria, Oregon	23.0
Valentine, Nebr	71.0	Key West, Fla	26.0
Northfield, Vt	70.5	San Francisco, Cal	27.3
Yankton, Dak	69.8	Portland, Oregon	27.3
Fort Assinaboine, Mont	67.3	San Diego, Cal	28.7

FROST.

Frost occurred in the south Atlantic and Gulf states as follows: 1st, Ark. 4th and 7th, Ala., Ark. 9th, Ark., La., Tex. 10th, Ala., Ark., Ga., La., Tex. 11th, Ala., Ark., Fla., Ga., La., Miss., N. C., S. C., Tex. 12th, Ala., Ark., Ga., La., Miss., N. C., S. C. 13th, Ala., Ark., Ga., N. C., S. C. 14th, N. C. 15th, Tex. 16th, La. 17th, Ark., Ga. 18th, 19th, N. C. 20th, La., S. C., Tex. 21st, N. C., Tex. 22d, Ala., Ark., Ga. 23d, Ala., Ark., Fla., Ga., Miss., N. C., S. C. Tex. 24th, Ala., Ark., Ga., La., Miss., S. C., Tex. 25th, Ala., Ark., Fla., Ga., La., Miss., N. C., S. C., Tex. 26th, Ala., Ark., Fla., Ga., La., Miss., N. C., S. C. 27th, Ala., Ark., Fla., Ga., La., Miss., N. C., S. C. 28th, Ala., Ark., Fla., Ga., La., Miss., N. C., S. C., Tex. 29th, Ala., Ark., Fla., Ga., La., Miss., N. C., S. C., Tex. 30th, Ala., Ark., Fla., Ga., La., Miss., N. C., S. C., Tex.

The following are reports of heavy frost in the Southern states:

Saint Augustine, Fla., 26th: this city was visited by frost last night, a heavy white frost appearing. Thin ice formed throughout the country.—*New York Herald, November* 27, 1888.

Alva, Lee Co., Fla., 26th: the frost which occurred last night was very destructive to tender vegetation.—*Report of voluntary observer.*

Columbia, S. C.: frosts have been reported generally throughout the state. In the early part of the month they were mostly light, but from the 23d to the 30th, inclusive, they were killing. Vegetation was entirely killed.—*South Carolina State Weather Service report.*

University, Miss.: the first frost sufficient to kill tender vegetation occurred on the 11th and 12th, generally throughout the central and northern parts of the state. Hoar frosts were reported on the Gulf coast at Pearlington on the 11th, 28th, and 29th, and at Biloxi on the 28th and 29th.—*Mississippi State Weather Service report.*

Auburn, Ala.: the frosts that occurred toward the close of the month, although heavy, killed only the delicate plants.—*Alabama State Weather Service report.*

New Orleans, La.: the warm spell of the first week of the month was followed by colder, fair weather, with heavy frosts in the northern and light frosts in the southern parishes.—*Louisiana State Weather Service report.*

Galveston, Tex.: the first killing frosts of the season were

generally reported on the 10th in the central, northern, and western counties.—*Texas State Weather Service report.*

As compared with the preceding month the southern limit of frost in the south Atlantic states has extended from middle Georgia to southern Florida in about latitude 26° 30′; in Alabama it has extended from the central portion of the state to the Gulf coast; in Louisiana frost was reported to the extreme southern part of the state and was of frequent occurrence, whereas in October it was not noted south of the thirtieth parallel, and in the state, as a whole, it was reported for but a very limited number of dates; in Texas it was reported as far south as Rio Grande City, while in October the most southerly station reporting frost was San Antonio.

In California frost occurred at Los Angeles on two dates, while at stations to the northward it was reported on from three to four dates.

LIMITS OF FREEZING WEATHER.

On chart vi are shown the southern and western limits of freezing weather during November, 1888. East of the Rocky Mountains the southern limit extends from the Mexican border (about lat. 29°, long. 104°) in a northeasterly direction to central Arkansas, thence southeastward to southern Alabama, and from that locality northeastward to the vicinity of Norfolk, Va., the distance from the coast from southern Alabama to Virginia generally ranging from sixty to one hundred miles. The line indicating the western limit is traced along the immediate coasts of Washington Territory and Oregon to northern California, from which point it extends in an irregular southeasterly direction to southeastern Arizona, there being a gradual increase of distance from the coast line from northern California southward.

TEMPERATURE OF WATER.

The following table shows the maximum, minimum, and mean water temperature as observed at the harbors of the several stations; the monthly range of water temperature; and the mean temperature of the air for November, 1888:

Stations.	Temperature at bottom.				Mean temperature of air at the station.
	Max.	Min.	Range.	Monthly mean.	
	°	°	°	°	°
Canby, Fort, Wash	54.2	45.0	9.2	49.7	47.4
Cedar Keys, Fla	77.0	56.0	21.0	67.3	61.8
Charleston, S. C	71.2	51.9	19.3	63.4	56.3
Eastport, Me	47.8	43.0	4.8	46.1	36.8
Galveston, Tex	75.8	53.9	21.9	64.8	60.6
Key West, Fla	81.7	72.3	9.4	77.6	74.7
New York City	53.0	41.7	11.3	49.1	45.2
Pensacola, Fla	74.5	62.0	12.5	68.7	58.2
Portland, Oregon	53.2	43.0	10.2	47.4	44.0

PRECIPITATION (expressed in inches and hundredths).

The distribution of precipitation over the United States and Canada for November, 1888, as determined from the reports of about one thousand stations, is exhibited on chart iv. In the table of miscellaneous meteorological data are given, for each Signal Service station, the total precipitation, with the departure from the normal. The figures opposite the names of the geographical districts in the columns for precipitation and departure from the normal show, respectively, the averages for the several districts. The normal for any district may be found by adding the departure to the current mean when the precipitation is below the normal and subtracting when above.

Over the southwestern portions of the country from the Mississippi River westward to the Rocky Mountains, and in nearly all districts east of the Mississippi, the precipitation for November was above the normal. It was below the normal in the eastern Gulf states and over the northern portions of the country from the upper lake region westward to the Pacific. The excess over the average in Florida and in the districts along the southwestern border was unusually large, the precipitation ranging from two to three times the normal amount. In the west Gulf states about fifty per cent. more than the normal amount of rain fell, and in the south Atlantic states and New England the rainfall exceeded the average by from thirty to forty per cent. In the upper Mississippi and Ohio valleys the excess amounted to about twenty per cent. of the normal, and in the middle Atlantic states to about six per cent.

Less than half of the normal amount of rain fell in the extreme northwest and northern slope. In the middle slope it was about 60 per cent. of the normal; in the east Gulf states, 70 per cent.; upper lake region, 80 per cent.; and northern plateau, 90 per cent. On the north Pacific coast, where the heaviest rainfalls of the month occurred, the normal was not reached, there being a very slight deficiency in that district.

In California, where but little rain fell in October, the November normal has been exceeded by more than 50 per cent.

DEVIATIONS FROM AVERAGE PRECIPITATION.

The following table shows for certain stations, as reported by voluntary observers, (1) the average precipitation for a series of years; (2) the length of record during which the observations have been taken, and from which the average has been computed; (3) the total precipitation for November, 1888; (4) the departure of the current month from the average; (5) and the extreme monthly precipitation for November during the period of observation and the years of occurrence:

State and station.	County.	(1) Average for the month of Nov.	(2) Length of record.	(3) Total for Nov., 1888.	(4) Departure from average.	(5) Extreme monthly precipitation for November.			
						Greatest.		Least.	
						Am't.	Year.	Am't.	Year.
		Inches	Years	Inches	Inches.	Inches		Inches.	
Arkansas.									
Lead Hill	Boone	3.93	7	5.13	+1.20	5.77	1883	2.50	1885
California.									
Sacramento	Sacramento	2.06	22	4.06	+2.00	11.34	1885	0.00	1884
Colorado.									
Fort Lyon	Bent	0.36	12	0.14	−0.22	1.50	1883	0.00	1870
Dakota.									
Fort Randall	Todd	0.59	21	trace.	−0.59	1.50	1866	0.00	1875
Florida.									
Merritt's Island	Brevard	2.43	11	3.15	+0.72	5.67	1884	0.17	1886
Georgia.									
Forsyth	Monroe	3.37	14	5.41	+2.04	5.41	1888	1.01	1887
Illinois.									
Peoria	Peoria	2.32	33	2.67	+0.35	4.93*	1879	0.71*	1875
Riley	McHenry	1.98	28	1.97	−0.01	5.30*	1879	0.72*	1875
Indiana.									
Logansport	Cass	3.03	34	4.37	+1.34	5.76†	1881	1.43†	1880
Vevay	Switzerland	3.16	21	6.34	+3.18	6.34	1888	0.37	1872
Iowa.									
Cresco	Howard	1.56	14	0.23	−1.33	5.20	1879	0.18	1875
Monticello	Jones	2.32	35	2.77	+0.45	5.29	1879	0.12	1865
Logan	Harrison	1.26	13	trace.	−1.26	3.30	1882	trace.	1888
Kansas.									
Lawrence	Douglas	1.92	13	4.54	+2.62	5.15	1879	0.36	1875
Wellington	Sumner	0.97	9	1.28	+0.31	1.98	1881	0.10	1886
Louisiana.									
Baton Rouge	Baton Rouge	5.09	24	1.91	−3.18	9.75	1855	0.45	1854
Grand Coteau	St. Landry	3.67	6	2.36	−1.31	5.71	1883	1.86	1887
Maine.									
Gardiner	Kennebec	4.34	50	5.98	+1.64	10.55	1845	1.14	1882
Maryland.									
Cumberland	Allegany	2.11	17	2.60	+0.49	5.10	1877	0.82	1887
Massachusetts.									
Somerset	Bristol	4.45	18	8.15	+3.70	9.02	1876	1.45	1882
Newburyport	Essex	3.45	9	6.74	+3.29	6.74	1888	0.97	1882
Amherst	Hampshire	3.36	14	4.30	+0.94	5.65	1885	1.33	1882
Michigan.									
Thornville	Lapeer	2.95	12	3.11	+0.16	5.03	1881	1.42	1882
Kalamazoo	Kalamazoo	2.98	13	2.49	−0.49	5.77	1877	1.24	1882
Minnesota.									
Minneapolis	Hennepin	1.25	13	0.45	−0.80	2.48	1886	0.31	1878
Missouri.									
Oregon	Holt	3.07	6	2.75	−0.32	7.81	1879	1.17	1878
Montana.									
Fort Shaw	Lewis-Clarke	0.44	18	0.03	−0.41	0.84	1884	0.01	1877
New Hampshire.									
Hanover	Grafton	2.67	51	5.14	+2.47	5.14	1888	0.59	1882

Deviations from average precipitation—Continued.

State and station.	County.	(1) Average for the month of Nov.	(2) Length of record.	(3) Total for Nov., 1888.	(4) Departure from average.	(5) Extreme monthly precipitation for November.			
						Greatest.		Least.	
						Am't.	Year.	Am't.	Year.
New Jersey.		*Inches*	*Years*	*Inches*	*Inches.*	*Inches*		*Inches.*	
South Orange	Essex	3.20	14	4.85	+1.65	6.62	1877	0.95	1883
Moorestown	Burlington ..	3.32	25	4.04	+0.72	6.30	1877	1.28	1882
New York.									
Palermo	Oswego.....	3.40	14	3.45	+0.05	5.75	1880	1.01	1882
Cooperstown.....	Otsego.....	3.06	34	3.09	+0.03	5.38	1858	1.45	1876
Ohio.									
Wauseon	Fulton	3.10	16	4.06	+0.96	5.83	1881	1.46	1884
Oregon.									
Albany	Linn.....	4.34	9	4.13	−0.21	8.40	1885	1.73	1880
Eola	Polk.....	4.92	18	4.30	−0.62	13.01	1877	1.45	1886
Pennsylvania.									
Dyberry	Wayne	3.17	18	4.61	+1.44	7.10	1886	1.40	1882
Grampian Hills ..	Clearfield....	2.99	18	3.66	+0.67	6.03	1886	1.42	1872
Wellsborough ...	Tioga.....	4.00	9	3.68	−0.32	6.61	1884	2.05	1885
South Carolina.									
Statesburgh.....	Sumter.....	1.87	8	1.76	−0.11	3.90	1882	0.87	1886
Tennessee.									
Milan	Gibson	4.17	5	4.66	+0.49	8.65	1886	1.61	1884
Austin	Wilson	3.97	13	6.61	+2.64	7.24	1874	1.50	1887
Texas.									
New Ulm	Austin	5.10	16	5.34	+0.24	14.93	1873	0.48	1887
Vermont.									
Strafford	Orange	3.37	14	6.20	+2.83	6.20	1888	0.50	1874
Virginia.									
Bird's Nest	Northampton	2.22	19	3.60	+1.38	6.75	1880	0.40	1879
Wytheville	Wythe.....	2.69	24	2.20	−0.49	7.10	1877	0.44	1887
West Virginia.									
Helvetia	Randolph ...	3.78	11	2.97	−0.81	7.98	1878	1.24	1887
Wisconsin.									
Madison	Dane	1.94	8	1.32	−0.62	3.51	1874	0.40	1875

* For 13 years. † For 9 years.

HAIL.

Hail is reported to have fallen as follows:

1st, Iowa, Minn., Mo.; 2d, Ark., Ill., Iowa, Mo.; 3d, N. Y.; 5th, Ill.; 6th, Colo.; 7th, Mo.; 8th, N. H.; 10th, Ariz., Ohio; 11th, Pa.; 12th, Ariz.; 13th, Tex.; 15th, Ga., Kans.; 16th, Ariz., Pa.; 17th, Nebr., N. Y.; 18th, Ind., Ohio; 22d, N. C.; 25th, Del., Md., Mass., N. H.; 26th, Cal., Me., Md., Mass., N. Y., Ohio, Pa., Vt., Va.; 27th, Ala., N. Y.; 28th, Ariz., N. Y.; 30th, Tex.

SLEET.

Sleet fell during November on the several dates as follows: 1st, Mont.; 5th, Dak.; 6th, Colo.; 7th, Mo.; 8th, Kans., Mo., N. Y.; 9th, Iowa, Kans.; 10th, Mich., Wis.; 11th, Conn., N. Y., Pa., Vt.; 12th, Vt.; 15th, Ill., Kans., Nebr.; 16th, Ill., Mo., N. Y., Pa., Vt.; 17th, Ark., Colo., Mo., N. Y.; 18th, Ill., Mo., N. Y., Ohio, W. Va.; 19th, Mich., Ohio; 23d, Ga.; 24th, Conn.; 25th, Conn., Me., N. H., N. J., Ill., Pa.; 26th, Conn., Me., Md., N. J., N. Y., Pa., Vt.; 27th, Ala., Me., N. Y., Ohio, W. Va.; 28th, Dak., Mich., Minn., Wis.; 29th, Ill., Iowa, N. Y., Ohio; 30th, Ark., Ill., Kans., Mich., Mo., N. Y., Ohio, W. Va., Wis.

SNOW.

On every day during the month snow occurred in some part of the United States. It fell over the greatest extent of territory between the 15th and 18th, and from the 25th to the end of the month. The periods during which snow was reported from the least number of stations are: 1st–3d, 11–13th, and 19th–23d. In Colorado, Dakota, Indiana, Michigan, Minnesota, New York, Ohio, Pennsylvania, and Vermont snow fell on from ten to sixteen dates. Eastward of the Mississippi River the most southerly latitude in which snow fell was N. 37°, 27th.

MONTHLY SNOWFALLS (inches and tenths) IN NOVEMBER.

It may be stated that in general the snowfalls of November were remarkably small. The greatest of the month occurred over the central and southern Rocky Mountain slopes, in the central portions of the Missouri Valley, the northern portion of the upper lake region, and in northern New England, where numerous stations report depths ranging from eight to ten inches. Southward of the fortieth parallel to the eastward of the Mississippi River the heaviest snowfalls occurred in West Virginia, where, in some portions of the state, as much as seven inches fell. No appreciable amount of snow fell to the southward of the thirty-seventh parallel to the eastward of the ninety-fifth meridian, and, with the exception of the southern Rocky Mountain slope, none fell to the south of that parallel to the westward of the meridian named. Along the immediate Atlantic coast from Rhode Island, southward the snowfall of the month was inappreciable. Over much the greater part of the northern districts of the country the total snowfall did not reach three inches, and over extensive areas in the central valleys and lake region it was of such a character that no measurable quantities were reported. Below are given all monthly snowfalls of three inches, or more, and in states and territories where the maximum depth was below that amount, the station reporting the greatest is given:

Arizona.—Flagstaff, 3. *Arkansas.*—Lead Hill, trace. *Colorado.*—Leadville, 9; Monte Vista, 6; Ranch near Como, 5.5; T. S. Ranch, 5.2; Greeley, 4.8; Georgetown, 4.5; Delta, 4; Denver, 3. *Connecticut.*—New Hartford, 5; Canton, Mansfield, Middletown, and Wallingsford, 4; New Haven, 3. *Dakota.*—Parkston and Rapid City, 5; Fort Pembina, 3.5. *Delaware.*—Viola, 1. *District of Columbia.*—Washington City, 1.5. *Idaho.*—Boisé City, 1.6. *Illinois.*—Martinsville and Vandalia, 5; Flora and Philo, 3. *Indiana.*—Worthington, 3. *Indian Territory.*—Fort Reno, 2. *Iowa.*—Osceola, 11; Grinnell, 3. *Kansas.*—Globe, 18; Elko, 13; Lawrence, 12; Augusta, 10; Leavenworth, 9.9; Topeka, 9.8; Wichita, 9; Havensville, 8; Yates Centre, 7.5; Lebo, 6.5; Rome, 6; Wakefield, 5.2; Morse, 4.5; Waterville, 4; Cunningham, 3.5; Elk Falls and Fort Leavenworth, 3. *Kentucky.*—Ashland and Millersburgh, 3. *Maine.*—Orono and Belfast, 10; Bar Harbor, 9.5; Cornish, 9.2; Kent's Hill, 8.5; Gardiner, 7.8; Mayfield, 7; Lewiston, 6; Portland, 5.5; Eastport, 5; Calais and Fort Preble, 4. *Maryland.*—Fallston, 5; Mount Saint Mary's, 3. *Massachusetts.*—Mansfield, 15; Rowe, 10; Blue Hill Observatory, Newburyport *b*, and Northampton, 9; Beverly Farms, 8; Newburyport *a*, 6.2; Chestnut Hill, Gilbertville, and Lawrence, 6; Amherst, Fitchburg, Ludlow, Somerset, and Springfield, 5; Boston, 4.8; Mount Nonotuck, 4; Holyoke, 3.9; Dudley and Milton, 3.5; Fall River, Fiskdale, and Leominster, 3. *Michigan.*—Fort Brady, 15.5; Sault de St. Marie, 11.8; Marquette, 8.4; Gaylord, 8; Hillman, 6; Alpena, 5.5; Mottville, 5; Calumet, 4.5; Lansing, 3.6; Alma, Deer Lake, Fletcher, and West Branch, 3. *Minnesota.*—Saint Vincent, 2.6. *Missouri.*—Conception, 7. *Montana.*—Helena, 5; Fort Custer, 4.5; Fort Keogh, 4. *Nebraska.*—Fort Robinson and Hay Springs, 3. *Nevada.*—Wellington, 12.5; Eureka, 4.3; Austin, 3. *New Hampshire.*—Berlin Falls and Berlin Mills, 10; Walpole, 8; Antrim and West Milan, 7; Chesterfield, 6; Concord, Manchester *a*, and Nashua, 5; Hanover and Plymouth, 4; Shaker Village and Stratford, 3. *New Jersey.*—Egg Harbor City, 1. *New Mexico.*—Fort Stanton, 10.5; Santa Fé, 7.7. *New York.*—Albany, 9.5; Constableville and Middleburgh, 9; Canton, 8.6; Ilion, 7.6; Barnes' Corners, 7.2; Johnstown and Wedgewood, 7; Auburn and Humphrey, 6; Lyons and White Plains, 5; Queensbury, 4.9; Rose, 4.5; Boyd's Corners, Carmel, Cooperstown, Ithaca, Penn Yan, Rochester, and South Canisteo, 4; Perry City and Plattsburgh Barracks, 3.5; Ardenia, Geneva, and Savona, 3. *Ohio.*—Cleveland, 5.3; College Hill, Lordstown, and New Athens, 3. *Pennsylvania.*—Wellsborough, 6.6; Eagle's Mere, 4.8; Grampian Hills, 4; Salem Corners and Pittsburgh, 3. *Rhode Island.*—Pawtucket, 6; Lonsdale, 5; Providence *a* and Woonsocket, 4; Kingston and Providence *b*, 3. *Tennessee.*—Rogersville and Springdale, trace. *Texas.*—Decatur and Fort Davis, 1. *Utah.*—Salt Lake City, 1. *Vermont.*—Jacksonville, 11; Coventry, 9.8; Strafford, 9; Brattleborough and East Berkshire, 8; Chelsea, 7; Manchester, 4.5; Burlington and Lunenburgh, 4; Northfield and Vernon, 3. *Virginia.*—Spottsville, 1. *Washington Territory.*—Spokane Falls, 0.3. *West Virginia.*—Middlebrook, 7; Hartmansville and Helvetia, 4; Tyler Creek, 3. *Wisconsin.*—Green Bay, 1.2. *Wyoming.*—Fort Washakie, 8; Cheyenne, 6.8; Fort Laramie, 6.

DEPTH OF SNOW REMAINING ON GROUND AT 15th AND CLOSE OF EACH MONTH.

With a view of publishing in the MONTHLY WEATHER REVIEW charts showing the depths of snow remaining on the ground at the 15th and end of the month the following letter was sent by the Chief Signal Officer to all co-operating observers between October 13th and 16th, 1888:

SIGNAL OFFICE, WAR DEPARTMENT,
Washington City, November, 15, 1888.

SIR: The Chief Signal Officer desires, in connection with the growth of winter wheat, etc., to publish with the MONTHLY WEATHER REVIEW of the Signal Service, for the benefit of those interested in agriculture, charts exhibiting the portions of country covered by snow on the 15th and at the close of the month, the region within which snow has fallen during the month in such quantity as to cover the ground more than temporarily, and the southern limit of freezing weather. With this end in view the voluntary and all co-operating observers are especially requested to enter upon their monthly forms the amount of snow, if any, remaining on the ground on the 15th and last day of each month from October to April, inclusive, and to add such notes as may be pertinent in connection with the beneficial or injurious effects of snow and frost on agricultural interests.

The reports furnished in compliance with the above request have been examined and show that with the exception of a few localities of limited extent there was practically no snow on the ground in any part of the United States on the 15th, therefore the chart contemplated for that date is omitted.

The amount of snow remaining on the ground at the end of the month is indicated on chart vi, from which it will be seen that, comparatively, but a small portion of the country was covered, and that, in general, the depths were below two inches. The one inch line extends from the upper lake region southward to the upper Ohio valley and thence northeastward, at some distance inland from the coast, to northern New England. Northward of the one inch line there are several small areas over which the depth of snow amounted to two inches or more, and in northern New Hampshire there is a small area over which there was more than 4 inches. In portions of Montana, Colorado, and New Mexico there are limited areas over which snow remained at the close of the month in depths ranging from 4 inches to inappreciable quantities.

EXCESSIVE PRECIPITATION.

From the accompanying table it will be seen that during the month of November very few rainfalls of ten inches, or more, have occurred in any part of the United States, with the exception of the Pacific coast northward of the thirty-seventh parallel. It appears from the records of the past five years that some portions of the immediate coast of Washington Territory are more frequently subjected to rainfalls in excess of ten inches than smaller amounts. This is true of both Tatoosh Island and Neah Bay, the records of the former station showing that in but one year since 1883 has the November rainfall been less than ten inches, viz., in 1884, when it was nearly seven inches. The normal rainfall for both Tatoosh Island and Neah Bay exceeds twelve inches. In northern California the rainfall during November in both 1875 and 1885 was remarkably heavy, especially in the latter year, when stations reporting amounts ranging from ten to twenty-nine inches were numerous. East of the Rocky Mountains the largest November rainfalls recorded are the following: Fort Barrancas, Fla., 17.79 in 1878; Point Pleasant, La., 20.89 in 1877, and 19.52 in 1880; Mount Washington, N. H., 17.55 in 1877, and 15.10 in 1881.

Daily rainfalls, reaching, or exceeding, two and one-half inches during November, while of uncommon occurrence, have been reported most numerously in the region extending from the central Mississippi, lower Missouri, and Ohio valleys southward to the Gulf, and along the Atlantic coast. None have occurred in the extreme Northwest and very few in the lake region. Notwithstanding the very large monthly rainfalls that occur on the north Pacific coast in November but few daily falls have reached two and one-half inches, a fact due to the steady and persistent character of the rains in that region at this season, which, while giving enormously heavy monthly falls, rarely exceed two and a half inches for twenty-four consecutive hours. The following are some of the greatest daily rainfalls shown by the records: Fort Barrancas, Fla., 10.39, 26th, 1878, and 6.07, 16th, 1881; Mattoon, Ill., 5.11, 26th, 1877; Vandalia, Ill., 5.00, 26th, 1887; New Orleans, La., 5.20, 9th, 1879; Point Pleasant, La., 6.80, 8th, and 7.10, 20th, 1877; Ellsworth, N. C., 5.00, 28th, 1880; Wellsborough, Pa., 5.50, 23d, 1884; Belmont Farm, Tex., 7.00, 1st, 1877; Galveston, Tex., 5.63, 6th, 1872; Palestine, Tex., 5.05, 10th, 1883.

The records for all regular and voluntary stations of the Signal Service during the entire period covered by the observations show but thirty-two instances in which rainfalls of one inch or more per hour have occurred in the United States during November, and two of these occurred at Los Angeles, Cal., the others occurred to the eastward of the one-hundredth meridian and were for the most part confined to the Southern States. At Galveston and San Antonio, Tex., Vicksburg, Miss., and Columbus, Ohio, hourly rainfalls of an inch, or more, have occurred twice since the beginning of observations, but at no other station has more than one such rainfall occurred. The most remarkable fall, both as to actual amount and rate per hour, was that which occurred at Galveston, Tex., November 2, 1873, when 3.50 inches fell in thirty minutes.

Table showing for the month of November monthly rainfalls of 10 inches, or more (in states where monthly rainfalls did not reach 10 inches the station reporting the maximum amount is given); rainfalls of 2.50 inches, or more, in any 24 consecutive hours; and rainfalls equaling or exceeding one inch in one hour.

States and stations.	Rainfall of 10 inches, or more, per month.		Rainfall of 2.50 inches, or more, in 24 hours.			Rainfall equaling or exceeding one inch per hour.			
	Amt.	Year.	Amt.	Day.	Year.	Amt.	Time.	Day.	Year.
Alabama.	*Inches.*		*Inches*			*Inches*	*h. m.*		
Florence	.....	.....	3.31	6	1885	.....	.....	.....	.....
Greensborough	.....	.....	6.00	6-7	1885	.....	.....	.....	.....
Green Springs	10.54	1880	2.60	22	1883	.....	.....	.....	.....
Marion	.....	.....	7.00	6-7	1885	.....	.....	.....	.....
Mobile	.....	.....	3.11	8	1872	.....	.....	.....	.....
Do	.....	.....	2.53	16	1876	.....	.....	.....	.....
Do	.....	.....	2.50	20	1877	.....	.....	.....	.....
Do	.....	.....	3.40	25	1878	.....	.....	.....	.....
Do	.....	.....	4.50	6	1881	.....	.....	.....	.....
Montgomery	.....	.....	2.97	8	1873	1.00	1 00	2	1876
Do	.....	.....	2.65	26	1878	.....	.....	.....	.....
Mount Vernon Barracks	.....	.....	2.70	7	1885	.....	.....	.....	.....
Summerville	.....	.....	2.75	28	1884	.....	.....	.....	.....
Arizona.									
Fort Mojave	6.16	1888	.....	.....	.....	.....	.....	.....	.....
Globe	.....	.....	2.99	23-24	1888	.....	.....	.....	.....
Arkansas.									
Fort Smith	.....	.....	2.56	9-10	1883	.....	.....	.....	.....
Do	.....	.....	2.54	7-8	1888	.....	.....	.....	.....
Helena	.....	.....	2.86	1	1877	.....	.....	.....	.....
Do	.....	.....	2.55	26	1882	.....	.....	.....	.....
Little Rock	.....	.....	4.40	7-8	1888	.....	.....	.....	.....
Lonoke	9.65	1888	.....	.....	.....	.....	.....	.....	.....
California.									
Alcatras Island	10.04	1885	.....	.....	.....	.....	.....	.....	.....
Alta	18.74	1875	.....	.....	.....	.....	.....	.....	.....
Angel Island	11.57	1885	2.64	24	1885	.....	.....	.....	.....
Año Nuevo Island	12.39	1875	.....	.....	.....	.....	.....	.....	.....
Aptos	10.65	1885	.....	.....	.....	.....	.....	.....	.....
Auburn	15.24	1885	.....	.....	.....	.....	.....	.....	.....
Bowman's Dam	24.96	*	.....	.....	.....	.....	.....	.....	.....
Cahuenga Valley	.....	.....	2.66	19	1885	.....	.....	.....	.....
Calistoga	15.67	1885	2.60	9	1879	.....	.....	.....	.....
Camp Lincoln	11.55	1866	.....	.....	.....	.....	.....	.....	.....
Camp Wright	16.67	1865	.....	.....	.....	.....	.....	.....	.....
Cherokee	14.26	1874	.....	.....	.....	.....	.....	.....	.....
Cherokee Reservoir	16.99	1874	.....	.....	.....	.....	.....	.....	.....
Cisco	17.05	1885	.....	.....	.....	.....	.....	.....	.....
Colfax	15.48	1885	.....	.....	.....	.....	.....	.....	.....
Crescent City	31.93	*	.....	.....	.....	.....	.....	.....	.....
Crystal Springs	12.29	1875	.....	.....	.....	.....	.....	.....	.....
Delta	29.38	1885	.....	.....	.....	.....	.....	.....	.....
Dunnigan	10.47	1885	.....	.....	.....	.....	.....	.....	.....
Emigrant Gap	18.69	1885	.....	.....	.....	.....	.....	.....	.....
Farallon Islands	11.12	*	.....	.....	.....	.....	.....	.....	.....
Folsom	10.91	*	.....	.....	.....	.....	.....	.....	.....
Fort Gaston	24.75	1865	.....	.....	.....	.....	.....	.....	.....
Do	24.54	1885	.....	.....	.....	.....	.....	.....	.....
Fort Humboldt	10.90	1865	.....	.....	.....	.....	.....	.....	.....
Fort Ter Waw	15.35	1859	.....	.....	.....	.....	.....	.....	.....
Georgetown	24.12	1875	.....	.....	.....	.....	.....	.....	.....
Gilroy	11.75	1875	.....	.....	.....	.....	.....	.....	.....
Grass Valley	16.99	1875	.....	.....	.....	.....	.....	.....	.....
Humboldt Light-House	13.56	*	.....	.....	.....	.....	.....	.....	.....
Hydesville	18.37	1885	.....	.....	.....	.....	.....	.....	.....
Jackson	12.80	*	.....	.....	.....	.....	.....	.....	.....
Kono Tayee	15.37	*	.....	.....	.....	.....	.....	.....	.....

Table showing for the month of November, &c.—Continued.

States and stations.	Rainfall of 10 inches, or more, per month.		Rainfall of 2.50 inches, or more, in 24 hours.			Rainfall equaling or exceeding one inch per hour.			
	Amt.	Year.	Amt.	Day.	Year.	Amt.	Time.	Day.	Year.
California—Continued.	*Inches.*		*Inches*			*Inches*	*h. m.*		
La Grange	10.58	1875							
Laytonville	18.91	*							
Los Angeles			3.41	8-9	1879	1.04	0 43	9	1879
Do						1.00	1 00	21	1886
Mendocino	19.14	1875							
Middletown	19.42	*							
Nevada City	21.55	*							
North Bloomfield	20.23	*							
Oakland	11.11	1885	3.04	24	1885				
Orleans	18.82	*							
Oroville	11.27	1885							
Petaluma	11.33	1885							
Pilarcitos	16.94	1875							
Placerville	17.64	1875							
Point Arenas	15.64	*							
Point Montara	10.98	*							
Red Bluff	17.05	1885†	3.83	2-3	1882				
Do	17.22	1885‡	5.93	8-9	1885				
Redding	13.31	1875							
Do	11.90	1885							
Ross Valley	15.96	*							
Sacramento	11.34	1885	4.29	17	1885				
San Andreas	17.30	1875							
San Diego			2.68	9	1879				
San Francisco	11.78	1885	3.98	23	1874				
Do			2.58	24	1885				
San Luis Obispo	12.90	1885	10.04	17-18	1885				
San Rafael	14.23	1874							
Do	15.24	1885							
Santa Cruz	13.80	1875							
Do	10.25	1885							
Saucelito	12.05	*							
Scott Valley	11.56	1861							
Shingle Springs	11.16	1859							
Suisun City	10.38	1885							
Summit	13.60	1885							
Tehama	10.42	1885							
Towles	14.40	1885							
Ukiah	19.24	*							
Vacaville	15.98	1885							
Weaverville	16.56	*							
Woodside	11.46	*							
Colorado.									
Pike's Peak	7.81	1878	2.91	1	1881				
Trinidad			2.61	7-8	1878				
Connecticut.									
Colebrook			3.60	8-9	1877				
Fort Trumbull			3.24	6-7	1872				
Do			2.60	23-24	1873				
Mystic			3.20	8-9	1877				
New Haven			2.93	10	1875				
New London			3.76	6-7	1872				
Do			3.36	23-24	1873				
Voluntown	8.39	1888	3.26	10	1888				
Dakota.									
Fort Totten	5.10	1881							
Delaware.									
Dover	10.53	1876	7.58	18-20	1876				
Do			3.30	24	1877				
Fort Delaware	10.40	1868	2.90	1	1868				
Do			3.00	20	1868				
District of Columbia.									
Washington City	7.18	1877	2.83	24	1877	1.00	1 00	24	1884
Florida.									
Archer			4.06	9	1888				
Cedar Keys			2.89	9	1888				
Fort Barrancas	17.79	1878	4.30	30	1877	1.39	1 20	11	1881
Do			3.29	15	1878				
Do			10.39	26	1878				
Do			3.83	6	1879				
Do			6.07	16	1881				
Do			3.15	26	1882				
Homeland			3.65	9-10	1888				
Jacksonville			3.75	27-28	1884				
Key West			2.54	9	1877				
Do			3.51	4	1884				
Kissimmee City			2.54	10	1888				
Manatee			4.48	9-10	1888				
Nama			3.40	10	1888				
Pensacola	11.07	1885	3.54	6	1881				
Do			2.69	11-12	1881				
Do			3.21	23	1884				
Do			2.69	5-6	1885				
Do			4.83	7-8	1885				
Do			3.08	27-28	1885				
Punta Rassa			2.70	28-29	1877				
Saint Mark's			2.70	26	1878				
Titusville			4.08	9-10	1888				
Georgia.									
Atlanta			2.65	26-27	1878				
Augusta			2.80	4	1871				
Do			2.64	6-7	1873				
Do			2.70	21	1877				
Duck			3.60	8	1888				
Ellerslie	12.60	1880							
Marietta			2.90	17	1886				
Milledgeville						1.22	1 00	17	1886
Quitman			6.70	5-6	1880				
Do			2.50	23	1881				
Rabun Gap			3.00	17	1886				
Saint Mary's			2.55	18-19	1878				

Table showing for the month of November, &c.—Continued.

States and stations.	Rainfall of 10 inches, or more, per month.		Rainfall of 2.50 inches, or more, in 24 hours.			Rainfall equaling or exceeding one inch per hour.			
	Amt.	Year.	Amt.	Day.	Year.	Amt.	Time.	Day.	Year.
Idaho.	*Inches.*		*Inches*			*Inches*	*h. m.*		
Fort Sherman	5.28	1885							
Illinois.									
Anna			3.51	21	1883				
Cairo			2.52	21-22	1874				
Do			2.74	22-23	1875				
Charleston	8.20	1881	5.21	26-27	1887				
Champaign			2.72	18	1881				
Chicago			3.38	11-12	1881				
Do			3.39	5-6	1883				
Greenville			3.40	26	1887				
Irishtown			2.63	27	1887				
Jordan's Grove			3.25	27	1887				
Louisville			4.25	21	1883				
Mattoon			5.11	26	1887				
McLeansborough			4.24	21	1883				
Morrison			4.08	5	1883				
Olney			2.80	8	1888				
Oquawka			3.00	8	1888				
Pana			3.25	26	1887				
Peoria			3.40	27	1858				
Rock Island Arsenal			4.64	18-19	1869				
Springfield			3.25	17-18	1881				
Sumner			2.60	8	1888				
Swanwick			3.92	21	1883				
Vandalia			5.00	26	1887				
Do			2.65	8	1888				
Windsor			2.73	26	1887				
Indiana.									
Arlington			3.00	14-15	1879				
Corydon			3.20	23	1883				
De Gonia			2.75	21	1883				
Delphi			2.50	8	1888				
Evansville	10.05	1880	3.64	21	1883				
Do			2.70	27	1878				
Franklin			4.25	21	1883				
Glenwood			3.27	21	1883				
Huntingburgh			2.75	2	1888				
Indianapolis			4.30	17-18	1881	1.00	1 00	18	1881
Do			3.71	21	1883	1.50	1 00	21	1883
Jeffersonville			2.68	21	1883				
Marengo	11.20	1888	2.76	21	1883				
Do			4.00	2	1888				
Mitchell			2.50	21	1883				
New Corydon			2.85	18	1881				
Do			3.87	20	1883				
Richmond			3.80	21	1883				
Rising Sun			3.25	13-14	1875				
Rockville			2.50	9	1888				
Saint Meinrad's Abbey			2.60	26-27	1878				
Spiceland			2.69	21	1883				
Vevay			3.85	22	1883				
Worthington			3.36	21	1883				
Indian Territory.									
Fort Sill			2.98	19	1877				
Fort Towson	9.37	1843							
Iowa.									
Clinton			2.65	5	1883				
Cromwell			2.50	1	1888				
Des Moines	6.49	1879	2.84	11-12	1879				
Guttenberg			2.60	11	1879				
Muscatine			2.58	5	1883				
Do			2.61	2-3	1888				
Nashua			4.79	11	1882				
Onawa			4.50	17	1886				
Kansas.									
Baxter Springs						1.10	1 00	1	1876
Fort Larned			3.00	18	1862				
Fort Leavenworth			2.66	26-27	1874				
Holton			3.00	3	1879				
Leavenworth *a*	7.85	1879	2.56	8	1879				
Do			2.58	11	1879				
Do			3.10	10-11	1881				
Leavenworth *b*			2.50	16	1886				
Waterville			2.78	11	1879				
Kentucky.									
Bowling Green	7.32	1880							
Louisville			2.57	26-27	1878	1.26	1 00	8	1888
Do			2.91	21-22	1883				
Paducah			2.73[3]	13	1883				
Do			2.87	22	1883				
Louisiana.									
Baton Rouge			3.10	27-28	1860				
Do			2.75	16	1874				
Do			2.70	7	1877				
Do			2.70	20	1877				
Lake Charles			3.40	7-8	1888				
New Orleans			2.80	12-13	1871				
Do			4.48	7-8	1872				
Do			2.61	4-5	1873				
Do			2.61	2	1876				
Do			2.99	6	1881				
Do			2.57	11-12	1883				
Okaloosa			5.20	9	1879				
Point Pleasant	20.89	1877	3.95	1	1877				
Do	19.52	1880	6.80	8	1877				
Do			7.10	20	1877				
Do			3.00	5-6	1880				
Do			3.48	9	1880				
Do			3.01	24-25	1880				
Do			6.03	11-12	1881				
Do			3.10	6-7	1885				

Table showing for the month of November, &c.—Continued.

States and stations.	Rainfall of 10 inches, or more, per month.		Rainfall of 2.50 inches, or more, in 24 hours.			Rainfall equaling or exceeding one inch per hour.			
	Amt.	Year.	Amt.	Day.	Year.	Amt.	Time.	Day.	Year.
Louisiana—Continued.	*Inches.*		*Inches*			*Inches*	*h. m.*		
Shreveport			4.00	22	1873				
Do			2.50	8	1881				
Do			4.83	10	1883				
Do			3.13	22	1884				
Do			2.90	24-25	1887				
Maine.									
Cornish			4.08	27	1877				
Gardiner	10.55	1845							
Mechanic Falls			3.47	26	1877				
Orono			2.68	9	1885				
Perry	13.00	1854							
Portland			2.69	15-16	1871				
Do			2.70	24-25	1871				
Do			3.76	25-26	1877				
Do			2.65	26-27	1883				
West Waterville			3.00	27	1877				
Maryland.									
Baltimore			2.85	24	1877				
Emory Grove	13.00	1878	3.00	23	1878				
Do			4.00	27	1878				
Fallston	10.27	1877	2.60	8	1877				
Mount Saint Mary's College	11.00	1881	2.67	8	1877				
Do			3.78	25	1877				
Do			2.94	1	1881				
Do			3.80	7-8	1881				
New Market	10.10	1877	3.78	25	1877				
Sandy Spring			5.00	23-24	1877				
Woodstock			3.51	26	1877				
Massachusetts.									
Boston	11.63	1840	3.00	15	1871				
Do	10.25	1845	3.45	17-18	1873				
Do	10.03	1876	5.43	20-21	1876				
Do			2.93	25-26	1877				
Do			3.09	18	1878				
Fall River	10.73	1888	3.00	9	1877				
Fort Independence			3.00	20	1874				
Do			5.25	21-22	1874				
Long Plain	11.47	1888							
Mansfield	10.18	1888							
Middleborough	10.23	1888							
Milton			3.07	20	1885				
Do			6.20	25-27	1888				
New Bedford			2.98	26	1877				
Princeton			2.63	9	1885				
Taunton			2.50	10	1888				
Thatcher's Island	11.18	1881	2.88	7	1876				
Do			3.06	26	1877				
Do			5.75	18-19	1878				
Do			3.14	18	1879				
Do			3.91	19	1881				
Wood's Holl	11.70	1876	2.90	7	1876				
Michigan.									
Litchfield			2.50	11-12	1881				
Mottville						1.02	1 00	27	1887
Niles			2.67	11	1881				
Northport	14.00	1882	2.90	18	1879				
Do			3.30	10-11	1882				
Do			5.25?	24-25	1884				
Traverse City			4.02	11	1882				
Minnesota.									
Saint Paul	3.93	1880							
Mississippi.									
Biloxi			3.25	9	1887				
Brookhaven			3.60	25-26	1878				
Do			2.60	11-12	1879				
Fayette	10.60	1880	5.60	27-28	1880				
Natchez			3.06	16	1869	3.06	2 00	16	1869
Starkville			2.55	27	1882				
Vicksburg	14.15	1880	2.90	1	1877				
Do	11.53	1883	2.83	7-8	1877	1.82	0 20	15	1879
Do			3.18	24-25	1880	1.81	1 20	28	1879
Do			2.93	28	1880				
Do			2.81	30	1880				
Do			3.32	11	1881				
Do			4.79	10-11	1883				
Do			4.02	22	1883				
Missouri.									
Boonville			3.10	18	1881				
Hermann			2.70	18	1881				
Lexington			2.66	1	1876				
Saint Louis			3.00	7	1847				
Do			3.32	27	1850				
Do			3.15	16	1869				
Do			2.99	17-18	1881				
Do			2.81	8-9	1882				
Springfield			2.51	26	1887				
Savannah	8.90	1878							
Montana.									
Fort Assiniaboine	3.76	1883							
Nebraska.									
Lincoln	4.25	1881							
Omaha	4.25	1879							
Plattsmouth						1.00	1 00	7	1874
Nevada.									
Carson City	7.01	1875							
New Hampshire.									
Auburn	11.20	1877	3.25	17	1878				
Do			4.00	22	1878				
Mount Washington			4.74	9	1877				
Do	17.55	1877	2.81	8	1881				
Do	15.10	1881	3.35	23-24	1884				

Table showing for the month of November, &c.—Continued.

States and stations.	Rainfall of 10 inches, or more, per month.		Rainfall of 2.50 inches, or more, in 24 hours.			Rainfall equaling or exceeding one inch per hour.			
	Amt.	Year.	Amt.	Day.	Year.	Amt.	Time.	Day.	Year.
New Jersey.	*Inches.*		*Inches*			*Inches*	*h. m.*		
Atlantic City			3.09	24	1877				
Do			3.70	8-9	1885				
Barnegat City	8.71	1877	2.83	20	1876				
Do			5.33	24-25	1877				
Lambertville			3.10	3	1860				
Do			3.65	2-3	1861				
Sandy Hook			2.75	22	1878				
New Mexico.									
Fort Selden	8.13	1888	7.75	24-26	1888				
New York.									
Buffalo			2.53	14-15	1871				
Fort Columbus			3.00	2-3	1861				
Fort Wood			2.60	2-3	1861				
Hess Road Station			2.60	10	1888				
Madison Barracks			2.52	10	1888				
Moriches			2.74	10	1875				
New York City			2.83	6-7	1873	1.10	1 05	10	1888
Setauket			3.50	1-2	1885				
West Point			2.50	1-2	1885				
White Plains	9.80	1878	3.90	27	1878				
North Carolina.									
Cape Lookout	12.23	1877							
Charlotte			2.75	28	1884				
Elsworth	13.50	1880	3.50	10	1880				
Do			5.00	28	1880				
Fayetteville			4.25	27	1878				
Flat Rock			3.12	18	1886				
Hatteras	12.68	1880	3.10	15	1880	1.00	1 00	24	1877
Do	13.02	1884	2.99	28	1882				
Do			3.12	26	1883				
Do			3.80	16	1884				
Highlands			4.00	26	1878				
Do			2.50	7	1881				
Do			3.10	9	1881				
Kitty Hawk			2.67	7-8	1875				
Do			2.66	19	1879				
Do			2.60	14-15	1880				
Do			2.87	28	1882				
Do			4.04	16	1884				
Lenoir			3.80	25	1886				
Portsmouth			2.78	28	1882				
Raleigh			4.52	1	1887				
Reidsville			5.00	7-8	1885				
Southport			2.90	22	1877				
Statesville			4.50	23	1877				
Do			2.79	25	1886				
Wilmington			2.78	14-15	1888	1.10	1 00	14	1888
Ohio.									
College Hill			2.50	14	1875				
Do			2.50	19	1881				
Columbus			2.95	18-19	1881				
Portsmouth			3.20	23	1835				
Do			2.90	20	1836				
Do			3.38	1	1846				
Toledo			2.68	13-14	1871				
West Milton	9.52?	1888							
Oregon.									
Astoria	19.12	1869	3.00	29	1875				
Do	13.00	1874							
Do	16.70	1875							
Do	12.45	1885							
Do	10.45	1888							
Bandon	18.21	1885							
Block House	16.20	1859							
Eola	13.01	1877	2.63	21	1877				
Fort Hoskins	18.10	1861							
Fort Stevens	22.21	1877							
Fort Umpqua	18.05	1861							
Fort Yamhill	16.27	1865							
Portland	10.22	1874	2.69	23	1874				
Do	15.77	1875	3.62	26-27	1883				
Do	10.03	1876	3.10	7	1885				
Do	12.45	1877							
Port Orford	14.18	1855							
Roseburgh			3.58	6-7	1885				
Yaquina Light-House			2.63	8	1887				
Pennsylvania.									
Carlisle			3.00	8	1877				
Do			3.20	24	1877				
Greencastle			2.57	8	1877				
Philadelphia			2.59	19-20	1876				
Tarentum			3.00	23	1875				
Wellsborough			5.50	23	1884				
Do			3.65	17-18	1886				
Do			2.60	23	1886				
York	9.50	1886	3.00	26	1886				
Zionsville						1.01	0 40	18	1886
Rhode Island.									
Newport			3.16	10	1875				
Do			2.91	7	1876				
Do			2.97	18	1878				
Kingston	9.57	1888							
South Carolina.									
Aiken			3.48	25	1883				
Charleston			4.17	8	1877				
Do			3.58	18-19	1879				
Do			3.92	14	1888				
Conway	7.50	1888							
Tennessee.									
Andersonville			3.00	7	1885				
Bolivar			3.67	21	1886				

Table showing for the month of November, &c.—Continued.

States and stations.	Rainfall of 10 inches, or more, per month.		Rainfall of 2.50 inches, or more, in 24 hours.			Rainfall equaling or exceeding one inch per hour.			
	Amt.	Year.	Amt.	Day.	Year.	Amt.	Time.	Day.	Year.
Tennessee—Continued.	*Inches.*		*Inches*			*Inches*	*h. m.*		
Beech Grove			2.65	17	1886				
Caryville			3.13	7	1885				
Chattanooga			3.08	30	1880	1.80	1 38	8	1888
Do			3.00	22	1883				
Do			2.82	6-7	1885				
Do			2.74	8	1888				
Covington			3.96	21	1886				
Farmingdale			3.17	7	1885				
Do			3.37	17	1886				
Fostoria			2.70	21	1886				
Grief			3.28	7	1885				
Johnsonville			2.98	11	1886				
Knoxville			2.55	16-17	1873	1.05	0 55	30	1880
Do			2.54	22-23	1874				
Do			2.79	25-26	1878				
Do			2.65	22-23	1883				
Do			3.14	6-7	1885				
Manchester			3.60	17	1886				
Memphis	9.63	1875	2.54	3-4	1875	1.00	1 00	11	1886
Do			3.24	21-22	1886				
Do			2.64	6-7	1888				
Riddleton			2.87	17	1886				
Do			2.65	22	1886				
Woodstock			3.15	21	1886				
Texas.									
Austin			2.89	9-10	1866				
Do			2.64	12-13	1870				
Do			3.50	15-16	1874				
Do			3.40	18-19	1874				
Do			4.20	28	1875				
Belmont Farm	13.00	1873	2.70	?	1874				
Do	12.00	1877	7.00	1	1877				
Do			4.00	17	1877				
Bluff Settlement	10.00	1874	8.00	14-16	1874				
Brownsville			2.60	13	1882	1.98	1 23	18	1888
Clarksville	13.00	1873							
Cleburne			2.75	22	1884				
Corpus Christi			4.59	7	1888	1.52	1 15	7	1888
Corsicana			3.62	23-24	1887	2.00	2 00	26	1887
Fort Brown			4.30	12-13	1874				
Galveston			2.67	12-13	1871	3.50	0 30	2	1873
Do			5.63	6	1872	1.48	0 15	5	1877
Do			4.06	2-3	1873				
Do			2.53	19	1877				
Do			2.51	22	1884				
Do			3.58	7-8	1888				
Gilmer	10.67	1860							
Indianola			2.95	5	1877				
Do			3.16	17	1878				
Mason			3.26	9	1878				
New Ulm	14.92	1873	2.75	22	1884				

Table showing for the month of November, &c.—Continued.

States and stations.	Rainfall of 10 inches, or more, per month.		Rainfall of 2.50 inches, or more, in 24 hours.			Rainfall equaling or exceeding one inch per hour.			
	Amt.	Year.	Amt.	Day.	Year.	Amt.	Time.	Day.	Year.
Texas—Continued.	*Inches.*		*Inches*			*Inches*	*h. m.*		
Palestine			2.95	25-26	1882	2.18	0 50	10	1883
Do			5.05	10	1883				
Do			2.51	3-4	1885				
Rio Grande City						1.02	0 55	16	1878
San Antonio						1.30	1 00	27	1887
Do						1.05	1 00	7	1888
Silver Falls			3.74	13-14	1888				
Utah.									
Salt Lake City	5.81	1875							
Vermont.									
Newport	7.80	1886							
Post Mill Village			2.80	17	1886				
Virginia.									
Boonsborough			4.50	24	1877				
Cape Henry			2.81	23	1881				
Lynchburgh	9.65	1877	4.23	22	1877				
Mount Solon			4.65	24	1877				
Norfolk						1.14	(‡)	10	1888
Washington.									
Cathlamet	13.20	1874							
Do	13.00	1875							
Fort Canby	19.07	1866	2.70	19-20	1888				
Do	13.72	1885							
Fort Cascades	12.95	1860							
Fort Vancouver	11.57	1853							
Neah Bay	27.60	1865							
Do	17.86	1878							
Do	19.60	1885							
Do	11.80	1886							
Do	11.20	1888							
Olympia	19.88	1877	3.24	15-16	1878				
Do	11.09	1878							
Do	10.18	1885							
Pysht	13.07	1885	2.63	13	1885				
Tatoosh Island	20.70	1869	3.58	28	1883				
Do	15.83	1883	4.13	29	1883				
Do	19.25	1885	2.97	27-28	1886				
Do	10.44	1886							
Do	10.15	1887							
Do	10.76	1888							
West Virginia.									
Helvetia	7.98	1878							
Wisconsin.									
Bloomfield			2.50	10-11	1879				
Cadiz			3.60	1-2	1888				
Manitowoc	10.11	1882							
Wyoming.									
Fort Laramie	3.23	1886							

* No date given. ‡ Railroad records. † Signal Service records. § Less than 1 hour.

WINDS.

The most frequent directions of the wind during November, 1888, are shown on chart ii, by arrows flying with the wind. On the Atlantic coast, south of the fortieth parallel, and along the Gulf coast northerly winds prevailed. In New England, the lake region, the Mississippi and Missouri valleys, the middle and southeastern Rocky Mountain slopes, and in the middle and southern plateau regions they were variable. In the northern plateau region southwest winds predominated, while on the immediate Pacific coast they were from northeast to northwest over southern California, west at San Francisco, north at Eureka, Cal., and south to east in Washington Territory.

HIGH WINDS (in miles per hour).

Maximum velocities of fifty miles, or more, per hour, other than those given in the table of miscellaneous meteorological data, have been reported as follows: Eastport, Me., 53, ne., 25th; Hatteras, N. C., 58, n., 24th, 52, n., 26th; Block Island, R. I., 82, ne., 25th, 52, ne., 27th.

LOCAL STORMS.

1st. *Iowa.*—Iowa City: The most noticeable storm of the month occurred on this date. The temperature of the day was 22° above the normal, corresponding to the normal temperature of the first week of September. A light thunder-storm with little rain extended over Iowa in the morning, and was followed by a much more intense one in the evening. In the valley of the Iowa and Cedar rivers this storm was most intense, and a straight blow traveled down this valley from 7 p. m. to 10 p. m., accompanied with heavy rain and lightning. The rain increased from about one-half inch in southern Mitchell county to nearly three inches at Iowa City. The wind was most severe between Waterloo and Vinton, destroying considerable town and farm property at La Porte City and Mount Auburn. It was not a tornado or cyclone but a straight blow. Hail and heavy rain fell only in connection with this storm just below the region of greatest intensity of the wind. —*Report of Iowa Weather Service.*

2d. *Illinois.*—Mattoon, Coles Co.: during a thunder-storm, hail of unusual size fell. *Missouri.*—Kansas City: a thunder-storm moving from southwest to northeast began 1.15 a. m. and ended 3.15 a. m. The thunder was very loud, and the lightning almost continuous. Maximum velocity of wind 30 miles per hour, from the southwest.

7th. *Texas.*—Abilene: a tornado was observed west of this station at 7.40 p. m., and disappeared 7.50 p. m. It was first observed twenty miles west of station. The track was through a sparsely settled section, and no serious damage was caused. In the afternoon a heavy thunder-storm, moving from west to east, occurred to the northwest of the station, continuing from 4.43 p. m. to 7.50 p. m. Light rain fell at this place from 7.15 p. m. to 7.48 p. m., during which time a very heavy rain was falling about two miles to the northwestward. An interesting

and detailed report of the tornado, with sketches and charts illustrating its prominent features, has been made by Sergeant J. M. Cline, Signal Corps, observer at Abilene, Tex.

9th. *Kansas.*—Wichita: high wind, accompanied by snow, prevailed; maximum velocity of wind, 30 miles per hour at 10 a. m., from the north, and at 2.35 p. m., from the northwest. Street cars were unable to run; business was generally interrupted; telegraph lines were reported down in all directions, and railroad trains were delayed. *Missouri.*—Kansas City: a snow storm caused much damage to telegraph and telephone wires. It is stated that this was the severest snow storm that has occurred in this section so early in the season in many years.

10–11th. *Michigan.*—Detroit: a severe sleet and hail storm, moving from northwest to southeast, occurred during the night. The storm, which began and ended quite abruptly, seemed to pass in streaks, as in some parts of the city no hail or sleet fell.

23d–24th. *Arizona.*—Globe, Gila Co.: the storm which passed over this place is reported as the severest November storm in that section of which there is a record; 2.99 inches of rain fell in twenty-four hours.

INLAND NAVIGATION.

In the following table are shown the danger-points at the various stations; the highest and lowest depths for November, 1888, with the dates of occurrence and the monthly ranges:

Heights of rivers above low-water mark, November, 1888 (in feet and tenths).

Stations.	Danger-point on gauge.	Highest water.		Lowest water.		Monthly range.
		Date.	Height.	Date.	Height.	
Red River:						
Shreveport, La.....	29.9	28–29	7.2	4, 5, 6	0.6	6.6
Arkansas River:						
Fort Smith, Ark ...	22.0	21	5.9	6, 7	1.1	4.8
Little Rock, Ark...	23.0	22	8.6	2, 3	1.9	6.7
Missouri River:						
Leavenw'rth, Kans.	20.0	11	5.9	29	5.0	0.9
Kansas City, Mo...	21.0	10, 11, 12	6.5	28, 29, 30	5.8	0.7
Mississippi River:						
Saint Paul, Minn...	14.5	4, 5, 6, 7	3.7	18–19	2.4	1.3
La Crosse, Wis	24.0	3, 4, 5, 6	3.9	27–30	2.9	1.0
Dubuque, Iowa	16.0	5, 6, 10, 11	3.8	28–29	3.0	0.8
Davenport, Iowa...	15.0	11–12	2.7	28, 29–30	1.9	0.8
Keokuk, Iowa	14.0	13	3.0	1	1.4	1.6
Saint Louis, Mo ...	32.0	16	9.0	5	5.1	3.9
Cairo, Ill	40.0	17	31.5	1	19.0	12.5
Memphis, Tenn....	34.0	19	25.1	1	13.0	12.1
Vicksburg, Miss ...	41.0	24–25	28.9	1	8.0	20.9
New Orleans, La ..	13.0	29–30	8.9	5, 6, 7	3.2	5.7
Ohio River:						
Pittsburgh, Pa.....	22.0	16	12.3	30	4.1	8.2
Parkersburg, W.Va.	38.0	12	17.8	25	— 2.5	20.3
Cincinnati, Ohio ...	50.0	10	34.0	30	17.6	16.4
Louisville, Ky.....	25.0	10	14.9	30	8.4	6.5
Cumberland River:						
Nashville, Tenn ...	40.0	13	26.5	7	6.4	20.1
Tennessee River:						
Chattanooga, Tenn .	33.0	12	21.0	8	5.4	15.6
Monongahela River:						
Pittsburgh, Pa.....	29.0	16	12.3	30	4.1	8.2
Savannah River:						
Augusta, Ga.	32.0	11	24.5	3, 4–7	9.4	15.1
Willamette River:						
Portland, Oregon ..	15.0	6	4.6	30	0.5	4.1

Oswego, N. Y., 2d: ice formed on the canal, between this city and Syracuse, during the past twenty-four hours, detaining boats several hours.

Dubuque, Iowa, 6th: navigation on the Mississippi River closed on this date.

Cairo, Ill., 13th: heavy drift-wood passed down the Ohio River up to this date, causing considerable damage to the steel bridge, tearing away its false work, and causing a loss of about $2,000.

Fort Totten, Dak.: thick ice formed along the shores of Devil's Lake on the 15th, and the lake froze over on the 16th, closing navigation for the season.

Fort Sully, Dak., 16th: the Missouri River is rapidly icing over, and navigation may be considered closed for the winter.

Fort Buford, Dak.: the Missouri River was full of floating ice on the 17th and 18th, and on the 19th was frozen over; it remained partially open until the 30th, when it was entirely frozen over.

Bismarck, Dak., 20th: the Missouri River is at an extremely low stage, with considerable slush ice.

Port Huron, Mich., 26th: navigation on the Saint Clair River is practically closed for the season.

FLOODS.

Seymour, Jackson Co., Ind., 10th: it has been raining here steadily for forty-eight hours; the White and Mascatituck rivers have overflowed their banks, and the low-lying lands are inundated. Much live stock has been drowned, and quantities of corn have been swept away.

HIGH TIDES.

Hatteras, N. C., 24th; Key West, Fla., Norfolk, Va., 26th; Wood's Holl, Mass., 25th to 27th. Atlantic City, N. J.: the high wind of the 25th and 26th caused the tide to rise to an unusual height, doing much damage to property. Kitty Hawk, N. C., 24th: a severe storm has continued since 7 a. m. of the 20th; the wind blowing from the northeast until 3 p. m. of the 24th, when it backed to north and continued steady at about sixty miles per hour. The tide in Currituck Sound was lower than ever before known. At Kitty Hawk wharf, where there is usually enough water for small steamers and sailing vessels, the water receded about seventy-five feet from the wharf. Between Nag's Head and New Inlet, a distance of about twenty-one miles, the entire "banks" were flooded by the tide, and all cattle on this low beach perished.

New London, Conn., 26th: the tide in the afternoon was about four feet above the usual high water mark. In consequence, several of the wharves were partially submerged. No serious damage followed. The Signal Service observer reports that this was the highest tide observed in twenty-five years.

LOW TIDE.

Kitty Hawk, N. C., 24th; Cedar Keys, Fla., 10th to 12th.

ATMOSPHERIC ELECTRICITY.

AURORAS.

Faint auroral displays were observed as far south as Lake Forest, Ill. They were most frequently noted at Saint Vincent, Minn., and were reported on from two to three dates in New England, south-central New York, the upper lake region, and the upper Mississippi and Missouri valleys.

At Fort Buford, Dak., an aurora was observed at 9.48 p. m. of the 5th, consisting of a diffused white light which rose to an altitude of 10° and covered 75° of the horizon; the aurora attained its maximum intensity at 10.30 p. m., when streamers rose to an altitude of 60°, above which a faint arch was visible. The display gradually faded away, and had entirely disappeared at 3.55 a. m. of the 6th.

Auroras were observed during the month, as follows: 1st, Pontiac, Mich.; 4th, Cornish, Me.; 5th, Fort Buford, Fort Sully, and Webster, Dak.; Hanover, N. H.; 6th, Fort Buford, Dak.; Escanaba and Traverse City, Mich.; 7th, Saint Vincent, Minn.; 10th, Lake Forest, Ill.; 12th, Nashua, N. H.; 13th, Wedgewood, N. Y.; 16th, Saint Vincent, Minn.; 17th, Madison, Wis.; 25th, Davenport and Webster, Dak.; Saint

Vincent, Minn.; 26th, Saint Vincent, Minn.; South Canisteo, N. Y.; 27th, South Canisteo, N. Y.; 30th, Independence, Iowa; Saint Vincent, Minn.

THUNDER-STORMS.

Thunder-storms were reported during the month, by states and territories, as follows: 1st, 9; 2d, 11; 3d, 4; 4th, 2; 5th and 6th, 9; 7th, 5; 8th, 9; 9th, 7; 10th, 5; 11th, 1; 13th, 1; 14th, 3; 15th and 16th, 1; 18th, 2; 19th, 3; 20th, 1; 22d, 1; 24th, 1; 25th, 3; 26th, 2. None were reported on the 12th, 17th, 21st, 23d, and 27th to 30th.

Thunder-storms were reported in the several states and territories, by days, as follows: Ala. and Ariz., 2; Ark., 1; Cal., 4; Colo., 1; Dak., 3; Fla., 7; Ga., 1; Ill., 5; Ind., 3; Ind. Ter., 1; Iowa, 3; Kan., 4; Ky., 2; La., 3; Md. and Mass., 1; Mich., 6; Minn., 1; Miss., 3; Mo., 5; Nebr. and N. H., 1; N. J., 3; N. Y., 2; N. C., 1; Ohio, 6; Pa. and S. C., 2; Tenn., 4; Texas, 8; Wis., 2. In Conn., D. C., Idaho, Me., Mont., Nev., N. M., Oregon, R. I., Utah, Va., Wash., W. Va., and Wyo. no thunder-storms were reported.

Thunder-storms were reported in the greatest number of states and territories (11) on the 2d. On the 1st, 5th, 6th, and 8th they were noted in nine; on the 9th, in seven, and on the 7th and 10th in five.

They were reported on the greatest number of days (8) in Texas. In Iowa they were noted on seven; in Mich. and Ohio on six, and in Ill. and Mo. on five.

MISCELLANEOUS PHENOMENA.

FOREST AND PRAIRIE FIRES.

Jackson, Jackson Co., Minn., 2d: prairie fires are still raging in Sioux Valley township; five lives are reported to have been lost and a large amount of property has been destroyed.

Yankton, Dak., 13th: a large prairie fire is raging south of this place on the Nebraska side; the sky was lighted up by its flames during the early part of the evening.

Huron, Dak., 14th: a prairie fire swept along the north line of Sanborn and the south line of Beadle counties on the 12th; a large amount of hay and grain was burned.

Gary, Deuel Co., Dak., 14th: prairie fires raged in a forty-mile gale yesterday; this morning they are apparently out.

Aberdeen, Brown Co., Dak., 14th: large prairie fires are burning west and southwest of this place.

Prairie and forest fires also occurred on the following dates: Fort Sully, Dak., 1st to 3d; Fort Sill, Ind. T., 1st to 6th, 11th, 12th, 29th, and 30th; Bismarck, Dak., 6th, 13th, and 14th; Red Bluff, Cal., 8th, 9th, 11th to 14th.

HALOS.

Solar halos were most frequently reported in Michigan, where they occurred on thirteen days. In Tennessee they were noted on ten days; in Virginia on eight; in California and Illinois on seven; and in New York and South Carolina on six days. In Ariz., Conn., Ark., Dak., Fla., Ga., Idaho, Iowa, Kans., Ky., La., Me., Md., Mass., Minn., Miss., Mo., Mont., Nebr., Nev., N. H., N. J., N. C., Oreg., Pa., R. I., Tex., Utah, Wash., and Wis. on from one to five. They were reported in the greatest number of states and territories (13) on the 4th. On the 20th, 21st, and 29th no solar halos were reported.

Lunar halos were most frequently reported in Michigan, where they were noted on twelve dates; in Dak., Iowa, Kans., and Pa. on nine; in Va. on eight; in Ill., Minn., N. Y., N. C., Oreg., S. C., and Tenn. on seven. In Del., D. C., Md., N. M., and R. I. no lunar halos were noted. They were reported in the greatest number of states and territories (26) on the 13th. On the 4th, 6th, and 30th no lunar halos were noted.

METEORS.

The distribution of meteors, by dates, over the country was as follows: 1st, Vevay, Ind.; Barren Creek Springs, Md.; Egg Harbor City, N. J.; Wedgewood, N. Y.; Statesburgh, S. C.; Cleburne, Tex. 2d, Barren Creek Springs, Md.; Beverly, N. J. 3d, Parkston, Dak.; Dubuque, Iowa; Beverly and Egg Harbor City, N. J.; Randolph, W. Va. 4th, Parkston, Dak.; Manatee, Fla.; Wilmington, N. C. 5th, Fort Sully, Dak.; Archer, Fla.; Vevay, Ind.; Moorestown, N. J.; Fort Stanton, N. Mex. 6th, Parkston, Dak.; Barren Creek Springs, Md.; Amherst, Mass.; Beverly and Egg Harbor City, N. J.; Quakertown, Pa. 7th, Parkston, Dak.; Mantansas, Fla.; Utica, N. Y. 8th, Mantansas, Fla. 9th, Parkston, Dak. 10th, Independence, Iowa. 11th, Mantansas, Fla.; Independence, Iowa. 12th, Mantansas, Fla.; Independence, Iowa; Barne's Corners, N. Y.; Wauseon, Ohio. 13th, Vevay, Ind.; Kalamazoo, Mich.; Kansas City, Mo.; Wedgewood, N. Y.; College Hill, Ohio; Austin Tex. 19th and 20th, Independence, Iowa. 21st, Independence, Iowa; Beverly, N. J. 22d, Fort Buford, Dak.; Havannah, Ill.; Independence, Iowa; Beverly, N. J. 23d, Cleburne, Tex.; Green Bay, Wis. 25th, Little Rock, Ark. 26th, Fort Sully, Dak. 27th, Beverly, N. J. 29th, Parkston, Dak. 30th, McMinnville, Oreg.

The following are more notable meteoric displays reported:

Fallston, Md.: a brilliant meteor was observed above the eastern horizon at 6.43 p. m., 6th, passing towards the north.

Green Bay, Wis.: a brilliant meteor was observed at 6.30 p. m., 23d; it moved from near the zenith in a northeasterly direction, and burst into many fragments when about 15° above the horizon.

Little Rock, Ark.: a very brilliant meteor was observed in the southern sky at 10.12 p. m., 25th, about half way between the horizon and the zenith, and passing from east to west; the meteor remained visible about two seconds, and was accompanied by a trail which was apparently over 30° in length.

MIRAGE.

San Diego, Cal.: the Coronado Islands and Point Loma were distinctly seen on the 8th. At the latter place the small buildings adjoining the light-house were plainly visible.

Mirage were also observed as follows: Webster, Dak, 6th, 19th, 21st; Huron and Woonsocket, Dak., 12th; Parkston, Dak., 12th, 16th; Kimball, Dak., 12th, 25th, 26th; New England City, Dak., 30th; Hampton, Iowa, 26th.

SUN SPOTS.

Prof. F. P. Leavenworth, director, Haverford College Observatory, Pa. (observed by Mr. H. V. Gummere, assistant):

Date. November, 1888.	Number of new—		Disappeared by solar rotation.		Reappeared by solar rotation.		Total number visible.		Faculæ.		Remarks.
	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	
1, 9 a. m	0	0	0	0	0	0	0	0	2	5	Definition good.
2, 12 m	0	0	0	0	0	0	0	0	5	34	Definition very good.
3, 3 p. m*	0	0	0	0	0	0	0	0	....	16	Definition good.†
5, 4 p. m	1	9	0	0	0	0	1	9	2	2	Definition poor.
6, 2 p. m	0	10	0	0	0	0	1	19	8	25	Definition very good.
7, 11 a. m	0	3	0	0	0	0	1	22	1	1	Definition poor.
12, 11 a. m	1	8	0	0	0	2	30	1	9	Definition very good.
13, 10 a. m	0	4	0	0	0	0	2	27	2	5	Definition good.
16, 9 a. m	0	0	0	0	0	0	2	17	1	8	Definition good; through cl'ds.
17, 9 a. m	0	0	1	6	0	0	1	3	0	0	Definition poor.
20, 10 a. m	0	0	0	0	0	0	1	1	4	9	Definition good.
21, 3 p. m	0	2	0	0	0	0	1	3	1	9	Definition poor.
22, 9 a. m	0	0	0	0	0	0	1	3	2	8	Definition poor.
30, 10 a. m	1	25	1	3	1	25	1	25	....	....	Definition good.‡

*Observed by Prof. F. P. Leavenworth. †Clouds; count of faculæ unfinished.
‡Clouds previous to observation of faculæ.

Sun spots were observed during the month as follows:

Mr. John W. James, Riley, McHenry Co., Ill.: None seen

until the 11th, then a group a little west of sun's meridian, and another one day from east edge. The largest spot, estimated at 31,400 miles in diameter, disappeared by solar rotation on the 16th, but failed to reappear on east edge. The other spot, estimated at 22,009 miles in diameter, disappeared by solar rotation on the 22d. Two other large spots on the east edge on the 27th.

Mr. H. D. Gowey, North Lewisburgh, Champaign Co., Ohio: sun spots were observed from the 11th to the 17th, and from the 20th to the 22d.

Mr. M. A. Veeder, Lyons, Wayne Co., N. Y.: 3d, much faculæ, followed by a large spot, came into view upon the sun; 17th, large spot and several smaller ones appeared; 26th, extensive disturbance, followed by spots, appeared.

VERIFICATIONS.

INDICATIONS FOR 24 HOURS IN ADVANCE.

The percentages of verifications of the 8 p. m. daily indications for November, 1888, as determined from comparison of succeeding telegraphic reports, are given in the table below.

The predictions for districts east of the Rocky Mountains for November, 1888, were made by 1st Lieutenant H. H. C. Dunwoody, 4th Artillery, U. S. Army, Acting Signal Officer and Assistant, and those for the Pacific Coast districts were made at San Francisco, Cal., by 2d Lieutenant J. E. Maxfield, Signal Corps; the verifications for all districts were determined by Assistant Professor C. F. Marvin.

Percentages of indications verified, November, 1888.

States.		States.	
Maine	84.4	Tennessee	84.9
New Hampshire	88.7	Kentucky	79.6
Vermont	80.3	Ohio	79.9
Massachusetts	82.2	West Virginia	80.9
Rhode Island	85.8	Indiana	77.3
Connecticut	83.1	Illinois	83.8
Eastern New York	78.8	Lower Michigan	83.2
Western New York	76.9	Upper Michigan	84.3
Eastern Pennsylvania	83.4	Wisconsin	88.1
Western Pennsylvania	81.3	Minnesota	85.3
New Jersey	81.5	Iowa	83.3
Delaware	84.9	Kansas	86.0
Maryland	84.7	Nebraska	89.9
District of Columbia	86.5	Missouri	83.9
Virginia	87.1	Colorado	85.5
North Carolina	88.8	Dakota	87.7
South Carolina	88.9	Southern California *	89.3
Georgia	84.5	Northern California *	88.9
Eastern Florida	86.1	Oregon *	78.9
Western Florida	80.6	Washington Territory *	78.0
Alabama	86.7	*By elements:* Weather	85.6
Mississippi	87.1	Temperature	82.2
Louisiana	90.1	Monthly percentage of weather and temperature combined †	84.2
Texas	86.7		
Arkansas	83.1		

* In determining the monthly percentage of weather and temperature combined, the Pacific coast states are not included. † The monthly percentage of weather and temperature combined is determined by multiplying the percentage of weather by 6, and the percentage of temperature by 4, and dividing their sum by 10.

CAUTIONARY SIGNALS FOR NOVEMBER, 1888.

Statement showing percentages of justifications of wind signals and cold-wave signals for the month of November, 1888:

Wind signals.—Total number of signals ordered, one hundred and forty-three; justified as to velocity, wholly, ninety-four, partly ten; justified as to direction, one hundred and twenty. Of the signals ordered, one hundred and fifteen were cautionary, of which seventy were wholly, and eight partly, justified; twenty-eight were storm, of which twenty-four were wholly, and two partly, justified. Seventy-five were ordered for easterly winds, of which fifty-seven were justified; sixty-eight were ordered for westerly winds, of which sixty-three were justified. Number of winds without signals, twenty-six. Number of signals ordered late, thirteen. Percentage of justifications, 68.2.

Cold-wave signals.—Total number of signals ordered, one hundred and eighty-five; number wholly justified, one hundred and twenty-one, of which six were ordered late. Number partly justified, two. Number of severe cold waves without signals, thirteen. Percentage of justifications, 63.2.

Percentages of local verifications of the weather and temperature signals, as reported by the directors of the various State Weather Services for November, 1888.

States.	Weather.	Temperature.	States.	Weather.	Temperature.
Illinois	89.0	91.0	Nebraska	89.8	92.6
Indiana	89.1	85.1	New York	87.0	84.0
Kansas	80.4	84.9	Ohio	82.0	81.0
Louisiana (northern)	88.0	96.0	Tennessee	89.8	91.6
Louisiana (southern)	92.0	84.0	Texas	78.7	87.2
Michigan	82.9	77.6			

STATE WEATHER SERVICES.

[*Temperature in degrees Fahrenheit; precipitation, including melted snow, in inches and hundredths.*]

The following extracts are republished from reports for November, 1888, of the directors of the various state weather services:

ALABAMA.

November has been unusually mild, both in the condition of the weather and the range of temperature. It was not until the month was half gone that the first heavy frost occurred. Twenty days were fair and pleasant—favorable for all farming operations.

The frosts that occurred toward the close, although heavy, killed only the delicate plants. The fall has been unusually late. The average temperature was 1°.7 above the normal. There were three periods in which precipitation occurred. The first was the 8th and 9th; the second, 14th and 15th; and the third was the 19th. The average rainfall was 0.61 below the normal.

Summary.

Temperature.—Monthly mean, 53.6; highest monthly mean, 59.4, at Mobile; lowest, 47, at New Market; maximum, 82.7, at Mobile, 3d; minimum, 20, at Valley Head, 28th; range for state, 62.7; greatest local monthly range, 57, at Valley Head; least local monthly range, 43, at Edwardsville.

Precipitation.—Average for the state, 3.69; greatest, 6.56, at Gadsden; least, 1.83, at Motes.

Wind.—Prevailing direction, north.—*P. H. Mell, Signal Corps, Auburn, director.*

ARKANSAS.

Summary.

Temperature.—Monthly mean, 49.9; highest monthly mean, 55.8, at Forrest City; lowest monthly mean, 45.5, at Ozone; maximum, 87, at Lead Hill, 1st; minimum, 21, at Dayton, 28th; range for state, 66; greatest local monthly range, 62, at Lead Hill; least local monthly range, 37, at Dallas, and Prescott.

Precipitation.—Average for the state, 5.08; greatest, 9.65, at Lonoke; least, 0.31, at Prescott. Snow fell at Fort Smith, Dallas, and Ozone on the 9th, and at Lead Hill 30th. The snow was light, and melted as it fell.—*Prof. John C. Branner, Little Rock, director; W. U. Simons, Corporal, Signal Corps, assistant.*

ILLINOIS.

This has been one of the finest and most favorable Novembers experienced in this state for many years. Take it all through the weather has been exceptionally fine, with light frosts, few rainy days, and very equable temperature. The rainfall has been sufficient, but as it came during a few days in the early part of the month, farming operations were in no wise interrupted.

The temperature was above the average while the extremes were less than usual; no very high or low temperatures being reached. The highest temperature was on the 1st and 2d, and the lowest on the 20th and 21st. There were numerous frosts, but none very severe. About an inch of snow fell on the 15th and 16th, but it did not remain on the ground.

Summary.

Temperature.—The mean temperature of the month, 41.5, was 1.2 above that of the previous ten years. The mean of the northern division was 39.2,

or 3 above that of ten years. The central division was 41.1, or 0.5 above that of ten years, and the southern division, 44.2, or 0.1 above.

Precipitation.—The rainfall was also above the average, but the days on which rain fell were comparatively few. The following are some of the largest rainfalls reported: Martinsville, 7.30; Centralia, 7.50; Albion, 7.00; Willow Hill, 7.79; Olney, 7.06; Sumner, 5.35; Pana, 6.25; Paris, 4.78; Philo, 4.41; Collinsville, 4.40; Palestine, 5.67; Mattoon, 4.70; Cairo, 4.85; Saint Louis, Mo., 4.40; Richview, 4.87; Oneida, 4.15; Jordan's Grove, 4.48; McLeansborough, 4.88; Eberle, 4.82; Greenville, 4.59; Golconda, 4.98; Winchester, 4.34.

There were a few thunder-storms on the 2d and 5th. Extraordinarily large hail fell, at Peoria, for a few minutes on the 5th at 9 p. m. Some of the stones were an inch in diameter, but the most of them were ragged at the edges and irregular in shape. No damage was done.

Wind.—Prevailing direction, northwest.—*Col. Charles F. Mills, Springfield, director; James Cassidy, Sergeant, Signal Corps, assistant.*

INDIANA.

The month opened with exceedingly high temperature; the highest occurred nearly everywhere on the 1st. The daily means show that the temperature remained more or less high till about the 16th, and steadily cool from the 17th, during the prevalence of the steady high pressure from that date, till the end of the month The lowest readings were noted on various dates between the 17th and 28th.

The mean temperature of the month was about 3 in excess of the normal; the absence of those sudden low temperatures which most often occur, for a short duration, in November, and which in certain years have reached a point far below zero, was remarkable; the decrease in temperature from day to day was so gradual that we fail to note any marked changes.

The precipitation during the month all fell during its first half, and the total amount measured about 1.95 above the normal for November; excessively heavy rains fell on the 2d, and at several stations on the 8th and 9th.

Snow of measurable quantity fell at nearly all stations on the 16th and 18th, that on the 16th being the first of the season in the southern and central portions of the state, but being followed by rain it melted soon after it had fallen; no snow on the ground within the state at the end of the month.

Thunder-storms of a mild nature occurred on the 2d, 4th, 5th, 6th, 9th, and 26th. Hoar-frost was deposited frequently and often quite heavily.

Summary.

Temperature.—Monthly mean, 43.0; highest monthly mean, 48.2, at Marengo; lowest monthly mean, 39.1, at Mauzy; maximum, 81, at Cannelton, 1st; minimum, 18, at La Grange, 21st; range for state, 63; greatest local monthly range, 56, at Columbia City; least, 46, at Huntingburgh and Crawfordsville.

Precipitation.—Average for the state, 5.21; greatest, 11.20, at Marengo; least, 2.90, at Crawfordsville.

Wind.—Prevailing direction, northeast.—*Prof. H. A. Huston, La Fayette, director; C. F. R. Wappenhans, Sergeant, Signal Corps, assistant.*

IOWA.

November, 1888, was mild, fair, and generally dry; prevailing winds, southerly and northwesterly. The weather, while too dry in the northwest, has been most beneficial in general in extending the grazing season and greatly favoring the husking of the corn crop.

The mean temperature was nearly 3 above the normal. Since 1871, November has but once (1878) been decidedly warmer, and once (1879) nearly as warm. In the sixties November was four times decidedly warmer than in this year. The first and last decades of the month were remarkably warm, exceeding the normal temperature by 5, while the middle decade was cool, being more than 1 below the normal. The 1st was the warmest, and the 16th was the coldest day. Notable disturbances occurred on the 1st, 5th, and 9th.

The total rainfall is almost entirely due to the storms of the 1st and 9th. It is greatest on a line drawn through Clarke, Johnson, and Clinton counties, being 4.50 at Iowa City, the highest thus far reported, and 80 per cent. in excess of the normal November rainfall at that place. Towards the southeast of this region of greatest rainfall the amount diminishes slowly, so that Davis and Lee counties received about 3. In a northwesterly direction the rainfall diminishes very rapidly, so that in a line drawn from the southwest to the northeast of Iowa City only about 1 fell. The entire northwestern half of Iowa received less than 1, and in fully one-half of that territory no measurable amount of precipitation fell during the month.—*Dr. Gustavus Hinrichs, Iowa City, director.*

KANSAS.

The temperature has averaged about 1 below the normal. A remarkable feature was the occurrence of the minimum temperature so far south as Coffey county, where the thermometer fell to 6 on the night of the 10–11th, at the same time only reaching 12 at Topeka. The minimum temperatures were generally lower through the middle than through the northern counties.

The precipitation has been confined principally to the counties east of an irregular line drawn from the northeast corner of the state to Sedgwick and Sumner counties; in this district there is an excess ranging from .29 in Sumner to 2.69 in Douglas, then diminishing to 1.14 in Leavenworth. Over the rest of the state there is a deficiency, which in several of the counties amounts to an entire absence of precipitation.

Summary.

Temperature.—Monthly mean, 38.1; highest monthly mean, 42.8, at Englewood; lowest monthly mean, 32.3, at Montero; maximum, 85, at Bunker Hill, 1st; minimum, 6, at Lebo, 11th; range for state, 79; greatest local monthly range, 74, at Lebo; least local monthly range, 52, at Sedan; greatest daily range, 47, at Lebo, 3d; least daily range, 0, at Wakefield, 29th.

Precipitation.—Average for the state, .67; greatest, 4.54, at Lawrence; least, .00, at Belleville Corners, Ellsworth, and Victoria.

Wind.—Prevailing direction, south.—*Prof. J. T. Lovewell, Topeka, director; T. B. Jennings, Sergeant, Signal Corps, assistant.*

KENTUCKY.

Summary.

Temperature.—Mean temperature of the state, 47.5, which is about 2 in excess of the average. The highest temperatures were 78.7, at Frankfort, 1st; 78.0, at Bowling Green, 1st and 15th; and 77.5 at Owenton, 1st and 2d. The lowest temperatures were 18.0, at Carlisle, 26th; 21.0 at Owenton, 21st, and 22.0 at Bowling Green, 27th. The mean of the daily maximum and minimum temperatures of all stations are, respectively, 56.3 and 40.0. These give a mean of 48.1, which is .6 greater than that attained from the 7 a. m., 2 and 9 p. m. observations. The greatest monthly range of temperature was 56, at Bowling Green, and the least, 46, at Millersburgh.

Precipitation.—The average for the state was 4.18, which is about .50 in excess of the normal. The greatest amount, 6.34, was recorded at Louisville, and the least, 1.39, at South Fork. Light snow fell on the 26th and 27th throughout the central and northern portions of the state. The greatest depth, 3, was reported from Ashland and Millersburgh. At the former place, and at Falmouth and Carlisle, 2 remained on the ground at the end of the month. The precipitation was not uniformly distributed throughout the month, heavy rains occurring on the 1st, 2d, 7th, 8th, and 18th; the others being, as a rule, comparatively light. Thunder-storms occurred at Louisville on the 1st, and at Lexington and Frankfort on the 2d.—*Dr. E. A. Grant, Louisville, director; Frank Burke, Sergeant, Signal Corps, assistant.*

LOUISIANA.

November, 1888, was very favorable to the agricultural interests, there being no protracted rainy spells, high and dangerous winds, or severe frosts to injure the staples.

The temperature during the first week was considerably above the normal for that period, but this warm spell was followed by colder, fair weather, with heavy frosts in the northern parishes and light frosts in the southern. The remainder of the month was generally cool and pleasant, the minimum temperatures of the last few days ranging from 30 to 45, varying according to distance from the Gulf. The average temperature for the month was 1.5 above the normal for November, the departure above the normal being greatest for the northern section.

The heaviest rainfalls occurred on the 8th in the southern section, and on the 18th and 19th in the northern, the greater number of stations reporting rainfall aggregating over 1 for the twenty-four hours on those dates. The monthly rainfall ranged from 1 to 4 throughout the state, the average being about 3 below the normal.

Summary.

Temperature.—Monthly mean, 58.6; highest monthly mean, 63.4, at New Iberia; lowest monthly mean, 53.2, at Plaquemine; maximum, 92, at New Iberia, on the 3d and 4th; minimum, 26.5, at Vidalia, on the 29th; range for state, 65.5; greatest local monthly range, 59.5, at Lake Charles; least local monthly range, 44, at Lake Providence; mean daily range of temperature for the state, 18.2.

Precipitation.—Average for the state, 2.15; greatest local monthly rainfall, 3.95 at Lake Charles; least, 0.82, at Houma; greatest daily rainfall, 3.40, at Lake Charles, on the 7–8th; average number of rainy days for the state, 6.

Wind.—Prevailing direction, northeast.—*R. E. Kerkam, Sergeant, Signal Corps, New Orleans, in charge.*

MICHIGAN.

The temperature has been above the normal and the precipitation below in all sections. There was but little snow on the ground during the month and four stations report a small amount at the end of the month.

Summary.

Temperature.—The mean for the month, 37.7, is 1.5 above the normal of thirteen years. It was above the normal in all sections of the state. The mean daily temperature was above the normal on fifteen days, below on eleven, and normal on six days. The highest mean daily temperature, 59, occurred on the 1st, when the temperature was 16 above the normal, and the lowest temperature, 23, occurred on the 17th and 20th, when the temperature was 13 and 9, respectively, below the normal. The highest mean daily temperature in the past thirteen years, 62, occurred on the 11th, 1882, and the lowest, 5, on the 21st, 1880. The highest mean monthly temperature, 38.3, in 1878 and 1883, and the lowest, 27.5, in 1880. The maximum temperature for the month, 77.5, occurred on the 1st, at East Saginaw, and the lowest, —2, on the 18th, at Gaylord.

Precipitation.—The average amount of precipitation for the month, 2.67, is .26 below the normal of thirteen years. The precipitation was below the normal in all sections, the greatest deficiency occurring in the upper peninsula, and the least in the southern section. Precipitation was general on the 2d, 5th, 8th, 9th, 10th, 15th, 16th, 27th, 28th, 29th, and 30th. The largest amount, 5.80, was recorded at Corunna, and the least, 1.05, at Montague. Comparing the precipitation of this month with the records of the past twelve

Novembers, it is found that the greatest amount was recorded in 1879, 4.47, and the least, 2.00, in 1878. Snow was reported in small quantities on the 10th, 15th to 19th, 27th, 28th, and 30th in the different sections.

Wind.—Prevailing direction, northwest.—*N. B. Conger, Sergeant, Signal Corps, Lansing, director.*

MINNESOTA.

November was remarkable for the exceptionally fair and pleasant weather which prevailed. The temperature was about 3 in excess of the normal. The precipitation was light, being scarcely a third of a seasonable average, and occurred principally during the first fifteen days of the month.

Summary.

Temperature.—The mean, 31.4, is about 3 above the normal. The following excesses in temperature are noted: Moorhead, 1.4; La Crosse, 1.8; Saint Paul, 2.2; Saint Vincent, 3.7; Minneapolis, 4.1; and Duluth, 4.9. The warmest days were the 1st and 13th, and the coldest the 16th and 17th. Frost was not a daily occurrence, except in the northern counties. The extremes of temperature were 72 at Farmington, 1st, and 9 below zero at Pokegama Falls, 17th, giving a monthly range of 81.

Precipitation.—The average precipitation was about .50. This is less than one-third of the November average for Minnesota. The most rain fell in the east and northeast, and the least in the southern and western parts of the state. Only 0.08 was deposited at Moorhead, which is less than 1 per cent of the normal at that place. Thunder-storms and rain occurred on the 1st. Light rain was quite general again from the 4th to the 6th. The next precipitation was snow on the 15th and 16th, which did not remain on the ground. The rest of the month was dry, except inappreciable rains on the last few days. The only station reporting as much as an inch of rain in twenty-four hours was Pine River Dam, where the fall on the 1st of November was 1.20.

Wind.—Prevailing direction, south.—*Prof. W. W. Payne, Northfield, director; John Healy, Private, Signal Corps, Saint Paul, assistant.*

MISSISSIPPI.

The month was notably mild, and very favorable to vegetation, which slowly yielded to the cold. Most of the days were favorable for finishing the harvesting of the cotton crop.

Summary.

Temperature.—Mean for the state, 55.5, which is 0.5 above the normal for November; highest monthly mean, 60, at Pearlington and Logtown; lowest monthly mean, 52, at University; maximum, 86, at Artonish, 2d; minimum, 28, at University, 28th; range for state, 58; greatest daily local range, 33, at Palo Alto, 4th; least daily local range, 0, at Lamar, 6th.

Precipitation.—Average for the state, 3.05, which is 1.44 more than for November, 1887, and 2.41 less than the normal; greatest, 4.51, at University; least, 1.73, at Artonish. Average number of rainy days, 8. Thunder-storms at Palo Alto on the 2d and at Pearlington on the 8th.—*Prof. R. B. Fulton, University, director; M. J. Wright, jr., Sergeant, Signal Corps, assistant.*

MISSOURI.

Summary.

Temperature.—The mean temperature for November was 42.2. The highest temperature reported in the state was 85, at Lamonte, and the lowest, 15, at Frankford. The average of maximum temperatures was 77.8, and the average of minimum temperatures, 22.1, making an average range of 55.7. The highest temperatures occurred from the 1st to the 5th, and the lowest on the 16th, and from the 21st to the 24th.

Precipitation.—The average precipitation was 3.32, which is 0.79 more than the November normal. The greatest amount reported was 6.54 at the central station, and the least was 1.00, at Langdon. In the state as a whole precipitation occurred on 18 days. The greatest number of days of precipitation at any one place was 11, at Cairo, Ill. The amount of snowfall in the state during the month was reported as follows: Oregon, 12; Savannah, 10; Kansas City and Conception, 7; Maryville, 6; Fayette and Frankford, 1.50; Fox Creek, Glasgow, Princeton, Sedalia, Steelville, Saint Louis, and Wither's Mill, 1; Harrisonville, Mexico, and Saint Charles, .50. Thunder-storms extending over the greater part of the state occurred on the 1st, 2d, 5th, and 6th.—*Prof. Francis E. Nipher, Saint Louis, director; G. A. Weber, Sergeant, Signal Corps, assistant.*

NEBRASKA.

The month has been characterized by warm, pleasant days, with prevailing cool nights and very little precipitation; none at all in some parts of the state.

Summary.

Temperature.—The month shows a mean of 37.2, which is about 1 above the normal. The maximum for the state was 80, which has not been exceeded, except last November, for ten years. The minimum for the month was 1 above zero. The minimum for past Novembers has had an extremely wide range, varying from 18.6 above zero in 1885 to 31.5 below in 1887.

Precipitation.—A considerable portion of the state throughout the central part had no precipitation, or next to none; the borders of the state generally from 0.3 to 0.6; a small area in the southeastern corner from 1 to 2. The mean for the southeastern section is 0.4, which is less than for any previous November, except in 1883 and 1884. The rainy days averaged two, which is slightly less than in previous Novembers.—*Prof. Goodwin D. Sweezey, Crete, director; G. A. Loveland, Corporal, Signal Corps, assistant.*

NEW ENGLAND METEOROLOGICAL SOCIETY.

The temperatures were unseasonably high in the early days of the month, and unusually low from the 21st to the 23d. The average temperature of the month at twenty-seven stations with back records exceeding ten years shows an excess of 1.8. The excessive precipitation was due chiefly to the great rainfall which attended the storm of the 25–27th. The excess was greatest in eastern Massachusetts and averaged 2.17 for the whole district. The precipitation has greatly exceeded the average for four consecutive months. The excess in August was 1.25, in September 4.55, in October 1.77, and in November 2.17, giving a total excess of 9.74.

Summary.

Temperature.—Monthly mean, 39.5 (98 stations); highest monthly mean, 47.4, at Nantucket; lowest monthly mean, 29.4, at Mayfield; maximum, 80, at Olneyville, 1st; minimum, —9, at Berlin Mills, 23d; range for New England, 89; greatest local monthly range, 86, at West Milan; least local monthly range, 38, at Nantucket; greatest daily range, 50, at Berlin Mills, 19th; least daily range, 0, at Rowe, 8th, 15th, 25th, Woonsocket, 26th.

Precipitation.—Average for New England, 6.32 (123 stations); greatest, 11.47, at Long Plain; least, 3.28, at Cornwall.

Wind.—Prevailing direction, southwest (17 stations).—*Prof. William H. Niles, Boston, Mass., president; Prof. Winslow Upton, Providence, R. I., secretary; Park Morrill, Sergeant, Signal Corps, assistant.*

NEW JERSEY.

Summary.

Temperature.—The mean temperature for November, 45.8, is 3.7 above the average determined from past records of fifty stations. The warmest days during the month were the 1st, 2d, 3d, 4th, and 6th, and the coldest the 21st, 22d, and 23d. The lowest temperature recorded in the northern portion of the state was 8, in the central 7, and in the southern 27. Highest monthly mean, 49.2, at Bridgeton; lowest monthly mean, 40.8, at Hanover; maximum, 77, at Gillette, Tenafly, and Imlaystown, 2d and 6th; minimum, 8, at Hanover, 23d; range for state, 69; greatest local monthly range, 67, at Tenafly; least local monthly range, 43, at Atlantic City; greatest daily range, 38, at Tenafly, 13th; least daily range, 1, at Newark, 25th.

Precipitation.—The average for the state, 3.97, is .55 above the average determined from past records of forty-eight stations; greatest, 5.41, at Trenton; least, 2.66, at Paterson. Average number of days on which precipitation equaled .01 inch, or more, 10.5. Average number of days on which cloudiness was 8, or more, on a scale of ten, 13.

Wind.—Prevailing direction, northwest.—*Prof. George H. Cook, New Brunswick, director; E. W. McGann, Sergeant, Signal Corps, assistant.*

NEW YORK.

Summary.

Temperature.—The highest temperature for the month was 75, at Middleburgh, 2d, and the lowest, —5, at Johnstown, 23d. The mean temperature for the entire state was 38.9; the 2d being the warmest day and the 22d the coldest. The mean was above the normal at all stations excepting Johnstown and Canton, where it was about normal.

Precipitation.—The average for the state was 3.86; all stations reporting an excess of rainfall excepting Ardenia, Cooperstown, Erie (Pa.), Friendship, Humphrey, Johnstown, and North Hammond. The greatest excess reported was 4.36, at Potsdam. The greatest daily rainfall was 2.70, on the 10th, at White Plains. The average number of days on which .01 or more of rain or melted snow fell was 13. Thunder-storms were reported on the 8th and 10th. Hail fell on the 3d, 17th, 26th, and 27th. Snow and frosts were of frequent occurrence.

Wind.—Prevailing direction, south.—*Prof. E. A. Fuertes, Ithaca, director; I. W. Brewer, Private, Signal Corps, assistant.*

NEVADA.

Summary.

Temperature.—The temperature was generally stationary and high. The highest reported, 85, occurred at Rioville, Lincoln Co., 3d, and the lowest, 0.1, at Elko, 30th. The average in the western part of the state was 38; the highest, 72.5, at Carson City, 2d, and the lowest, 12, at Carson City, 29th. The average in the central part was 39; the highest, 64, at Austin, 1st, and the lowest, 11, at Austin, 30th. The mean in the east central part was 36; the highest, 60, at Ely, 5th, and the lowest, 7, at Ely on the same day. The average in the northeastern part was 40.9; the maximum, 80, at Elko, 7th, and the lowest, 0.1, at Elko, 30th. A cold wave crossed the eastern part of the state about the 5th, and was felt very perceptibly at Ely and Tuscarora. A general cold spell prevailed from the 27th to the 30th.

Precipitation.—The precipitation generally was above the average. The snow was so mixed with rain that it was impossible to measure it separately, though it has covered the high mountains since the 3d. At that time the depth in Bullion, Elko Co., was two feet, the fall in Virginia City was heavy, the hills around Hawthorne were capped, and the depth in the high mountains was so great that it will last all winter. The precipitation at Wellington was 5 on the 4th, and on the 17th 6.5. At Crane's ranch, in Elko Co., it fell to a depth of 6. Although several reports have not been received it would seem safe to say that the precipitation would average an inch south of the Central Pacific railroad. This amount coming before the ground was frozen will

greatly benefit the farmers. Storms were general in the state and embraced periods about the 3d, 16th, 20th to 23d, and 26th.

Wind.—Prevailing direction, northwest.—*Prof. Charles W. Friend, Carson City, director; E. H. Thompson, Private, Signal Corps, assistant.*

NORTH CAROLINA.

Summary.

Temperature.—Monthly mean, 51.6; highest monthly mean, 61.4, at New Berne; lowest monthly mean, 42, at Marion, Va.; maximum, 90, at New Berne, 10th; minimum, 20, at Marion, Va., 12th; range for state, 70; mean monthly range, 47.8; greatest monthly range, 59, at New Berne; least monthly range, 35.1, at Petersburgh, Va.; mean daily range, 15.1; greatest daily range, 19.2, at Mount Pleasant; least daily range, 8.5, at Hatteras.

Precipitation.—Average for the state, 3.29; greatest monthly rainfall, 6.30, at Southport; least, 1.08, at Marion, Va.

Wind.—Prevailing direction, northeast.—*Dr. Herbert B. Battle, Raleigh, director; H. McP. Baldwin, Sergeant, Signal Corps, assistant.*

OHIO.

Summary.

Temperature.—The mean temperature of the northern section was 41.9; of the middle section, 42.4; of the southern section, 44.3, and of the state, 42.9. These means are 2.2, 2.5, 1.9, and 2.2, above the seven year means of the sections and state, respectively. The maximum temperature recorded during the month was 80.5, at Portsmouth, on the 5th. This is the highest maximum on record for November since the opening of the bureau. The minimum temperature was 17.3, at Bangorville, on the 21st. This is the highest monthly minimum on record for November. The mean relative humidity, 81.3 per cent., was 3.1 per cent. above the average.

Precipitation.—General rains occurred in all sections on the 2d, 3d, 6th to 10th, 15th, 16th, 18th, 19th, 27th; in the northern on the 28th, 29th, and 30th, and in the middle section on the 28th. Local rains occurred in all sections on the 11th, and in the middle and southern sections on the 30th. Snow was reported from the northern section from the 15th to 18th, 25th to 30th; from the middle section on the 10th, 16th, 18th, 25th to 30th, and from the southern section on the 16th, 17th, 26th, 27th, and 29th. The mean rainfall for the northern section was 3.56; for the middle section, 4.53; for the southern section, 4.36; and for the state, 4.25. These means are 1.01, 1.39, 1.29, and 1.23 above the seven year average for the sections and the state. The greatest monthly rainfall was 5.75, at North Lewisburgh, and the least 1.99 at Springborough. The prevailing direction of wind was south.—*Prof. B. F. Thomas, Columbus, director; Lieut. Charles E. Kilbourne, secretary; C. M. Strong, Private, Signal Corps, assistant.*

OREGON.

Summary.

Temperature.—Monthly mean, 44, which is 10 lower than the October mean; mean maximum, 60.1; mean minimum, 27.2; highest mean, 49.6, at Bandon; lowest mean, 35.6, at Fort Klamath; maximum, 72, at Ashland, 8th; minimum, 12, at Fort Klamath, 27th; range for the state, 60, which is 10.5 less than for October; greatest local range, 48, at Ashland; least local range, 19.3, at Fort Canby, Wash.; greatest local daily range, 40, at Ashland, 8th; and least, 0, at Albany, 27th. Maximum temperature occurred on 1st and 2d in the northwest and along the coast, and on 7th and 11th in other parts of the state. Minimum occurred in northern section on 14th and 15th, and in the central and southern on or about the 28th. The monthly mean is slightly above the normal.

Precipitation.—Monthly average, 4.31, which is .63 below the normal and .81 above the average for October. Greatest, 10.45, at Astoria; least, .87, at Walla Walla, Wash. The precipitation was generally well distributed over the state, and had a very marked effect upon vegetation.

Winds.—Prevailing direction, southerly. — *Wm. Bell, Sergeant, Signal Corps, Roseburgh.*

PENNSYLVANIA.

Summary.

Temperature.—The mean was 42.0, which is about normal. The average daily range was 16.9. The mean of the daily maximum was 50.6; minimum, 33.7. The following stations reported the highest average temperatures for the month: Shamokin, 47.9; Catawissa, 46.3; Pottstown, 46.0, and Philadelphia, 45.8. The lowest averages were Greenville, 35.3; Eagles Mere, 37.0; Wellsborough, 37.2; Philipsburgh, 37.5, and Dyberry, 37.6. The highest temperatures recorded during the month were Meadville, 79; Philipsburgh, Catawissa, Carlisle, and Indiana, 77. These occurred on the 1st. The lowest were Eagles Mere, 4.0; Wellsborough, 6.0; Dyberry, 8.0; Honesdale, 9.0; Wysox, 10.0; Philipsburgh, 10.0; Smethport, 10.0, and Coudersport, 10.0. These were noted on the 23d.

Precipitation.—An average of 3.37, was quite evenly distributed throughout the state. The greatest amount in any one day fell on the 15th, on which date several stations had over 1. There were ten days on which general rains did not occur. Several light snowfalls were reported. The largest total snowfalls for the month were Eagles Mere, 10.50; Wellsborough, 6.55; Rimersburgh, 4.25; Grampian Hills, 4.00; Carlisle, 3.00; Uniontown, 3.25; Huntingdon, 3.35; Scranton, 3.00; New Bloomfield, 3.00; Girardville and Dyberry, 3.00. Very little snow remained on the ground at the end of the month.

Wind.—Prevailing direction, west.—*Under direction of the Franklin Institute, Philadelphia; T. F. Townsend, Sergeant, Signal Corps, assistant, in charge.*

SOUTH CAROLINA.

The mean temperature was four-tenths above that for November, 1887. The highest temperatures generally occurred on the 8th, and the lowest on the 26th and 27th.

Summary.

Temperature.—Monthly mean, 52.7; highest monthly mean, 62.2, at Timmonsville; lowest monthly mean, 40.3, at Cedar Springs; maximum, 81.6, at Columbia State Experimental Station; minimum, 22, at Cedar Springs; range for the state, 59.6; greatest local monthly range, 28.2, at Cedar Springs; least local monthly range, 10.6, at Clinton.

Precipitation.—Average for the state, 2.77; greatest, 7.54, at Charleston; least, 1.15, at Cheraw; average number of rainy days, 7.6, as compared with 4.3 for November, 1887. The cold wave warning received at Columbia on the 10th, and distributed, was timely; the warning was fully justified and received favorable comment.—*Hon. A. P. Butler, Columbia, director; H. C. Seymour, Private, Signal Corps, assistant.*

TENNESSEE.

The features for November were the large percentage of cloudiness and a higher degree of temperature than usual for the month.

Summary.

Temperature.—The mean was 49.1, about 2 above the November mean of the six years past, and the highest during that period since 1883. The highest local mean was 52.2, at Austin, and the lowest, 46.7, at Lawrenceburgh. The maximum temperature observed was 86, 2d, at Waynesborough, and was 2 higher than the maximum observed in October, and was the highest November maximum by 4 during the six years past. The minimum temperature observed was 19, 27th, at Hohenwald, and, 28th, at Lawrenceburgh; this was the highest November minimum during the period above mentioned. The maximum of temperature was generally recorded in the eastern division on the 7th; in the middle division on the 1st, 2d, 7th, and in the western division on the 1st. The minimum of temperature was generally recorded on the 27th. The ranges of temperature were less than usual for November. There were two cold-wave warnings, the 9th and 16th, both of which were verified, and proved of great benefit. At Clarksville, in the first instance, the temperature fell from 64 to 38, and in the second it fell from 56 to 32. Other stations report similar results.

Precipitation.—The mean was 4.38, the greatest November mean for the past six years, except in 1886, when it measured 2 more. The greater part of this fell during the first decade, and the remainder during the second. From the 6th to the 9th the rainfall was very heavy in the middle and western divisions, and from the 14th to the 20th the rains, though light, were almost continual throughout the state. The greatest monthly rainfall was 6.53, at Memphis, and the least was 2.35, at Greeneville. The greatest local daily rainfall was 2.74, at Chattanooga, 8th. The next greatest was 2.20, at Savannah, 6th, and 2.00 on the same day at McKenzie. The heaviest rains fell on the 6th and 8th, from 1 to 2 being reported at most of the stations on those two days. The day of the greatest rainfall was the 8th, when the fall averaged considerably more than an inch for the entire state. The rain of the 6th, which was confined to the middle and western divisions, averaged also more than 1 inch for the territory on which it fell. The other days of heavy rainfall were the 9th, 14th, 15th, and 19th. Of the amount which fell during the month the eastern division received an average of nearly 3.75; the middle division nearly 4.50, and the western division a little more than 5. There were fourteen days on which no measurable rainfall was reported. Fogs were variously reported on about fourteen days; dews on three days, and frosts on thirteen days, those of the 4th, 11th to 13th, 23d to 27th, inclusive, being reported as killing frosts. A light fall of snow was reported in the northeastern portion of the state on the 27th and 29th, not sufficient to measure. Sleet was reported at only one station on the 29th.

Wind.—prevailing directions, north and northeast, the former prevailing in the middle division, and the latter in the eastern and western divisions.—*J. D. Plunket, M. D., Nasheville, director; H. C. Bate, Signal Corps, assistant.*

TEXAS.

The meteorological features of the month were the prolonged norther, or succession of northers, which commenced on the 8th and continued to the end of the month, and the excessive precipitation. Except during the first eight days the weather was not generally favorable to the maturing and gathering of cotton; small grain, however, appears to have done well.

Summary.

Temperature.—Average for the state, 54.2; mean maximum, 64; mean minimum, 47.5; maximum, 90.2, at Rio Grande City, 2d; minimum, 25, at El Paso, 10th; range, 65.2; greatest local monthly range, 62, at Fort Elliott; least local monthly range, 39.2, at Galveston; average range for the state, 51.3. The average number of days on which the temperature rose above 80 was five, and the average number on which it fell below 40 was eight.

Precipitation.—Average for the state, 4.61; this average was somewhat in excess of the normal for the month. The greatest amount at any station in any consecutive 24 hours was 3.82, at Corpus Christi, 7th; greatest monthly precipitation, 8.64, at Corpus Christi; least, 1.32, at El Paso.—*S. O. Young, M. D., Galveston, director; Allen Buell, Sergeant, Signal Corps, assistant.*

Meteorological record of voluntary observers and Army post surgeons, November, 1888.

The maximum and minimum temperatures at stations marked thus (*) are from readings of other than standard instruments.

Stations.	Temperature. (Fahrenheit.) Max.	Min.	Mean.	Precip'n.
Alabama.	°	°	°	*Ins.*
Bermuda	78	67	55.0	3.00
Butler				2.64
Carrollton	79	30	54.5	2.40
Citronelle	87	30	59.1	3.75
Edwardsville	78	33	55.5	5.90
Florence	74	28	50.7	3.09
Gadsden	78	28	53.3	6.56
Greensborough	72	30	57.0	3.13
Livingston	82	29	55.1	2.13
Mt. Vernon B'ks	86	29	58.5	2.92
Mount Willing	81	30	55.7	3.55
Motes	73	22	52.8	1.85
New Market	73	31	50.8	4.71
Talladega	76	26		3.90
Troy	82	33	52.2	4.38
Tuscaloosa	79	25	52.6	3.33
Tuscumbia	78	26	51.7	3.20
Union Springs	82	30	54.0	4.08
Uniontown	80	29	56.9	2.95
Valley Head	77	20	50.3	4.62
Arizona.				
Ash Canyon				1.03
Antelope Valley				2.53
Cedar Springs				2.55
Eagle Pass				2.84
Flagstaff				2.35
Fort Huachuca	78	33	50.7	2.78
Fort McDowell	82	35	58.8	1.03
Fort Mojave	83	40	57.2	6.10
Globe	76			3.01
Holbrook*	68	18	45.2	2.28
Teviston				1.14
Tucson	85	36		2.06
Whipple Barracks	64	24	43.8	3.13
Winslow (1)	68?	18?	43.7?	1.69?
Winslow (2)	71?	9?	35.0?	0.32?
Williams	64	20	39.3	4.60
Willow Springs				1.76
Arkansas.				
Alexander	80	27	46.6	6.93
Conway	80	30	49.1	7.92
Dallas	66	29	50.4	2.00
Dayton	78	21	50.6	3.30
Forrest City	76	34	55.8	3.25
Heber	76	26	47.0	5.05
Hot Springs		27		4.95
Lead Hill	67	25	45.2	5.13
Lonoke	77	30	52.3	9.65
Melbourne	76	34	51.1	6.87
Ozone	72	30	45.5	4.54
Portia	80	24	47.5	3.68
Prescott	75	38	54.4	0.31?
Stuttgart	78	25	49.5	3.38
Texarkana	85	32	53.5	2.60
Washington	83	32	51.4	7.06
British Columbia.				
New Westminster	52	25	42.2	7.18
California.				
Alcatraz Island	69	46	55.5	3.55
Angel Island	82			2.84
Banning	81	38	59.3	5.25
Benicia Barracks	72	36	55.8	2.92
Colegrove				4.38
Fort Bidwell	60	11	39.4	1.10
Fort Gaston	69	34	47.9	2.08
Fort Mason	70*	48	55.4	3.52
Georgetown	72	34	51.8	4.67
Hanford †	74	30	53.6	1.69
Hydesville †	70	30		3.03
Lewis Creek *†	76	40	58.0	2.57
Nicolaus	78	31	53.1	3.27
Oakland	73	41	55.7	3.52
Oroville	76	38	50.4	4.14
Presidio of San F	73	39	55.3	3.52
Riverside *	79	36	59.9	2.66
Sacramento	71	28	48.8	4.06
Salinas †	77	31	52.4	1.64
Santa Barbara	79	45	59.1	5.62
Santa Maria	80	34	56.6	2.59
Susanville †	60	20	40.8	1.45
Willow	74	33	54.7	3.33
Colorado.				
Alma	51	— 4	23.4	0.36
Aspen			26.7	1.59
Canyon City	74	18	39.2	0.74
Climax			19.5	1.60
Delta	59	14	33.4	2.15
Dolly Varden Mine	37	— 7		
Fort Collins			32.3	0.38
Fort Lewis	58	8	33.4	1.74
Georgetown	54	7	32.7	0.70
Glenwood Springs	68	26	36.3	2.22
Greeley	61	11	34.8	4.80
Gunnison			25.6	0.26
Husted	69	9		0.22
Idaho Springs †	66	8	30.9	0.63
Leadville	49	0	25.3	0.66
Monte Vista	58	5	30.2	0.35
Currey	59	12	31.4	4.69
Pacif			32.8	T.

Stations.	Temperature. (Fahrenheit.) Max.	Min.	Mean.	Precip'n.
Colorado—Cont'd.	°	°	°	*Ins.*
Ranch near Como	52	1	26.0	0.40
Rocky Ford †	74	18	38.5	0.30
T. S. Ranch			32.8	1.55
Thon	71	0	31.9	0.06
Connecticut.				
Birmingham				4.79
Canton	69	7		4.74
Clark's Falls				8.01
Colchester	70	11	42.1	
Hartford (1)	61	8	37.6	5.19
Hartford (2)				5.31
Lake Konomoc				7.71
Mansfield	69	9	39.7	4.94
Middletown	68	10	41.2	6.16
New Hartford*	64	6	35.7	4.44
Pomfret				6.02
Shelton	65	14	40.5	5.60
Thompson	68	8	38.9	
Uncasville				8.13
Vernon Centre				4.34
Voluntown †	67	13	43.4	8.39
Wallingford	72	7	40.1	4.42
Waterbury				5.86
W. Simsbury				4.27
Dakota.				
Brookings	67	2	30.5	
Davenport	58	— 4	28.0	0.06
Fort A. Lincoln	60	0	27.8	
Fort Meade	55	— 8	24.5	0.16
Fort Pembina	53	— 8	25.8	0.35
Fort Randall	72	4	35.2	
Fort Sisseton	60	4	30.9	
Fort Sully	67	3	35.6	0.11
Fort Totten	59	— 3	27.0	0.27
Fort Yates	59	— 1	29.1	0.08
Gallatin *	54	0	26.0	
Garden City	58	3	29.0	0.09
Goddard			31.7	
Grand View †	87	16	50.9†	0.15
Kimball *†		10		0.10
New England City †	65	— 4	25.7	0.05
Parkston *†	78	2	31.9	0.10
Spring Lake *†	60	—12	17.1	0.05
Webster	69	0	32.0	0.20
Woonsocket	64	— 1	28.7	0.10
Delaware.				
Kirkwood*†		24	43.3	
Newark	72	19	44.7	3.86
Viola †	72	26	44.7	2.50
District of Columbia.				
Distribut'g Res. *†.	73	24		3.72
Kendall Green *†	72	24	47.0	2.44
Receiving Res'v'r*†	74	24		3.38
Wash. Aqueduct *†	76	28		
Florida.				
Altamonte Springs	87	39	65.5	3.68
Alva *	88	34	68.4	4.56
Archer	94	29	62.9	7.61
Fort Meade *†	87	34	60.0	3.71
Homeland †	86	36	67.6	4.25
Kissimmee City *	87	36	65.0	6.24
Manatee	90	38	69.0	5.33
Matanzas	85	42	64.2	4.80
Merritt's Island	84	45	67.9	3.15
St. Francis B'k's	84	40	62.3	7.00
Tallahassee	82	33	57.5	6.10
Georgia.				
Andersonville	97	29	54.3	4.65
Athens	76	30	51.5	6.61
Duck	73	30	48.9	8.48
Forsyth *	83	36	56.9	5.41
Hephzibah	76	39	58.3	0.90
Marietta	77	28	51.0	4.68
Milledgeville	76	32	53.9	4.41
Quitman	80	36	59.2	4.85
Idaho.				
Boisé Barracks	61	19	38.6	0.26
Fort Sherman	52	15	36.1	2.11
Lewiston	61	21		1.37
Illinois.				
Albion	75	25	43.7	6.40
Aledo	77	16	39.4	2.45
Aurora*	76	18	38.7	3.27
Beason	78	19	39.4	2.61
Belvidere	73	13	38.7	2.52
Benton	82	20	39.7	3.40
Brush Hill	80	18	42.1	2.96
Camargo	76	22	41.5	
Cedarville	69	15	37.1	2.40
Centralia	76	22	40.0	7.50
Charleston *	79	22	41.9	4.35
Collinsville	78	26	43.6	4.40
Dwight	79	16	40.3	2.53
Eberle	72	22	43.2	4.82
Fairfield	80	28	48.7	1.99
Flora	76	20	43.0	6.16
Gibson City	73	20	40.0	2.90
Golconda	82	28	47.7	4.98
Greenville	76	23	43.2	4.59
Griggsville	75	15	43.2	4.30

Meteorological record of voluntary observers, &c.—Continued.

Stations.	Temperature. (Fahrenheit.) Max.	Min.	Mean.	Precip'n.
Illinois—Cont'd.	°	°	°	*Ins.*
Hennepin	81	16	39.4	3.10
Irishtown	80	24	44.8	3.58
Jacksonville	76	22	41.6	2.00
Jordan's Grove	79	24	43.1	4.48
Kampville	81	20	41.9	2.53
Lacon	80	24	41.8	2.83
Lake Forest	74	41?	39.7	2.80
Lanark	72	17	40.5	3.13
Mahomet	76	21	40.7	3.11
Martinsville	68	22	40.3	7.30
Marengo	67	13	37.1	1.97
Mascoutah	78	24	45.1	3.20
Mattoon †	77	22	42.0	4.70
McLeansborough	79	26	45.2	4.88
Mount Morris	75	16	38.5	4.20
New Athens	76	29	44.6	2.05
Nunda	71	13	37.0	2.50
Old DuQuoin	78	26	45.0	4.60
Olney	78	25	43.0	7.06
Oneida	78	18	38.7	4.15
Oquawka	78	26	44.7	3.63
Oswego †	74	15	37.7	3.21
Ottawa	76	16	36.8	3.38
Palestine	76	24	43.1	5.67
Pana	78	26	37.8	6.25
Paris	74	24	41.0	4.78
Peoria	80	25	41.9	2.67
Philo †	74	18	41.2	4.41
Pontiac	76	18	40.9	1.38
Richview	76	25	44.3	4.87
Riley	67	13	37.1	1.97
Rockford	73	15	38.2	2.39
Sandwich *†	77	19	41.3	3.33
Sumner	76	26	41.3	5.35
Sycamore †	71	15	37.1	1.80
Vandalia	73	26	42.4	4.20
Wapella	75	22	41.0	3.50
Waseka	76	19	39.8	3.20
Wheaton	72	20	38.2	
White Hall	76	26	43.0	3.09
Willow Hill	78	27	44.2	7.79
Windsor	77	22	42.6	4.20
Winchester	82	17	44.1	4.34
Winnebago	72	14	38.3	2.67
Indiana.				
Angola	72	21	40.6	3.54
Blue Lick	75	28	45.9	0.48
Butlerville*	74	25	45.5	6.51
Cannelton	81	27	47.5	5.01
Columbia City	75	19	40.8	3.17
Columbus	72	24	41.9	6.20
Connersville	72	23	43.0	7.32
Crawfordsville	72	26	43.0	2.90
De Gonia Springs	75	27	45.9	6.48
Delphi	75	20	40.4	4.78
Farmland	74	22	43.7	5.20
Franklin	73	25	43.1	5.63
Huntingburgh	72	26	45.2	6.94
Jeffersonville	75	27	46.1	6.61
Laconia †	75	24	45.1	5.15
La Fayette	73	21	41.2	4.27
Lagrange	73	18	39.8	3.35
Logansport †	80	25	42.6	4.37
Marengo	79	28	48.2	11.20
Marion	75	22	40.0	3.40
Mauzy	70	19	38.7	0.78
Mount Vernon	72	26	47.0	4.70
Princeton	75	27	44.9	4.05
Richmond	70	23	41.2	6.13
Rockville	72	24	44.2	5.80
Salem			44.6	7.25
Scalesville	81	27	47.5	5.05
Sunman	72	22	43.4	5.70
Seymour	76	26	46.2	5.62
Spiceland	73	23	42.8	5.50
Vevay	78	24	46.8	6.34
Worthington	74	22	43.6	4.61
Indian Territory.				
Fort Gibson	83	25	50.2	3.36
Fort Reno	85	20	45.2	0.46
Fort Supply	81	20	42.6	0.38
Iowa.				
Amana	71	15	36.7	3.59
Cedar Rapids	69	12	36.5	4.12
Clarinda *†	74	11	38.5	2.05
Clinton	76	16	37.5	4.19
Cresco	69	0	32.8	0.23
Cromwell *			35.1	3.10
Des Moines	74	13	39.0	0.38
Dysart †	68	9	36.1	1.95
Elkader	70	10	35.8	2.20
Fayette	68	5	34.6	1.51
Fort Madison †	75	19	40.0	1.43
Glenwood (1)	76	8	38.5	
Glenwood (2)	82	12	39.2	0.37
Grinnell	76	14	38.4	3.02
Hampton	72	6	33.4	0.07
Humboldt	73	6	33.5	6.60
Independence *†	66	14	36.5	1.47
Iowa City*	73	23	41.1	4.17
Logan †	76	10	38.8	
Maquoketa *†	72			3.41
Manson *†	74	12	36.6	0.04
Monticello *†	70	12	36.9	2.77
Mount Pleasant*	73	20	38.8	2 93

Stations.	Temperature. (Fahrenheit.) Max.	Min.	Mean.	Precip'n.
Iowa—Continued.	°	°	°	*Ins.*
Mount Vernon †	68	14	38.1	3.33
Muscatine †	78	18	38.5	4.43
Osage				0.78
Osceola †		8	29.4	1.90
Oskaloosa (1) *†	75	16	39.1	3.21
Oskaloosa (2)*	74	16	42.8	3.78
Sac City †	68	10	32.3	0.00
Smithland				T.
Vinton †			36.0	1.96
Washington	76	18	39.6	3.23
Wesley	72	7	33.3	0.10
Kansas.				
Allison				0.21
Augusta		26		1.75
Belleville	63			0.00
Bendena*	77	28	44.2	2.00
Bucklin				0.31
Buffalo Park	80	10		0.25
Brookville	86	17		0.10
Bunker Hill	85	20		T.
Carneiro	82	20		0.00
Cawker City	76	14	36.1	0.10
Colby	72	14	35.1	0.70
Collyer	78	10		0.10
Concordia	73	16	36.2	0.58
Concordia (near)	78	14	36.2	0.83
Cunningham *	79	18	38.3	0.35
Dorrance	80	20	42.3	0.00
Elco	81	22	40.0	2.80
Ellis	82	12		T.
Elk Falls	84	25	45.3	1.62
Ellsworth	80	20		0.00
Englewood	78	22	42.8	0.13
Fort Hays	82	8	38.8	0.10
Fort Leavenworth	78	20	41.0	2.66
Fort Riley	77	16	40.2	0.20
Gibson	80	8	37.1	0.35
Globe †	77	22	38.4	3.40
Gorham	80	14		0.33
Grainfield	78	14		
Grinnell	78	14		0.02
Grenola	81	20	40.2	1.10
Gove City	75	9	33.5	
Havensville			37.5	1.25
Hays City	80	16		
Kanopolis	78	18		0.00
La Harpe *†	79	23	39.6	1.69
Lawrence	79	21	39.2	4.54
Lebo	80	6	37.5	1.65
Leoti		14		0.27
Manhattan *	80	15	39.4	0.90
McAllaster	72	14		
Montero	73	12	32.3	0.22
Monument	74	14		0.50
Morse *†	80	22	39.0	2.30
Oakley	72	18		
Ogallah	78	20		
Quinter	78	15		0.50
Rome	80	23	42.7	1.17
Russell	80	16		
Salina *†	72	28	43.7	0.30
Sedan *†	78	26	41.9	1.78
Seneca	76	12	37.5	0.96
Tribune	79	12	35.6	0.29
Victoria	80	20		0.00
Wakefield *†	80	21	40.0	0.72
Wa Keeney	79	12		
Walker	78	9		
Washburn College	81	12	35.6	2.91
Waterville	75	16	38.4	0.45
Wellington	75	22	40.6	1.28
Winona	70	14		T.
Wilson	80	20		
Yates Centre	79	17	39.4	2.43
Kentucky.				
Ashland †	77	19		2.91
Bowling Green	78	22	50.6	5.17
Carlisle †	72	18	40.6	4.45
Falmouth †	61	30	43.3	5.11
Frankfort	79	23	45.7	4.51
Madisonville †	74	26	47.1	2.21
Millersburgh †	72	31	49.6	3.70
Owenton (1)	77	27	49.3	
Owenton (2)	71	22	45.8	
Queensborough d	78	27	49.2	
South Fork *	75	23	46.6	
Whiteaburgh	76	44	54.1	3.64
Louisiana.				
Abbeville	85	38	60.4	1.85
Baton Rouge	82	36	60.9	1.91
Cheneyville	81	30	57.8	1.00
Clinton	81	29	55.7	1.55
Convent	87	33	59.7	1.10
Crowley	82	33	57.2	3.36
Donaldsville	83	34	58.2	1.83
Farmersville	83	31		3.05
Franklinton	79	35	59.6	1.97
Grand Cane	67	30	50.7	2.60
Grand Coteau	84	39	58.9	2.36
Hahnville*	88	35	62.5	2.20
Houma	84	36	60.3	1.72
Kenner	84	34	60.4	2.50
Lake Charles	88	29	57.1	3.95
Lake Providence	85	41	62.9	2.66
Liberty Hill	87	29	54.0	4.64

Meteorological record of voluntary observers, &c.—Continued.

Stations.	Temperature. (Fahrenheit.) Max.	Min.	Mean.	Precip'n.
Louisiana—Cont'd.	°	°	°	*Ins.*
Luling †b	83	47	58.5	3.23
Mandeville	84	34	60.9	2.13
Many	90	36	57.6	3.06
Maurepas	84	35	.....	1.30
Marksville	78	34	55.9	1.50
Melville (West)	84	31	58.4	2.32
Monroe	81	32	55.5	3.20
Mount Airy	90	36	62.7	2.05
New Iberia	92	36	63.4	2.20
Plaquemine	85	28	53.2	2.19
Point Pleasant	79	34	55.5	2.25
Rayville	.....	28	.....	.....
Saint Martinville	81	50	65.0	1.03
Shell Beach	83	45	61.4	.....
Vidalia	82	26	57.5	1.85
Maine.				
Bar Harbor	60	6	39.1	7.60
Belfast	63	9	37.8	.....
Calais	64	4	36.7	6.75
Cornish	70	1	35.2	5.85
Fort Preble	.....	.....	.....	6.56
Gardiner	66	1	36.4	5.98
Kent's Hill	68	3	34.3	4.94
Lewiston	69	6	36.2	5.77
Mayfield	58	— 4	29.4	6.90
Orono	65	3	35.7	6.43
Petit Manan	58	9	37.1	.....
Maryland.				
Barren Creek Sp'gs.	76	28	48.5	3.46
Cumberland	76	20	42.8	2.60
Fallston	70	21	45.2	3.97
Fort McHenry	72	22	50.4	2.86
Gaithersburgh	.....	18	42.0	.....
Galena †	.....	28	46.7	3.41
Gambrill's	72	25	49.3	.....
Great Falls *†	74	22	.....	3.85
Jewell *†	.....	28	47.9	5.65
McDonogh	71	22	45.4	3.36
Mt. St. Mary's Col.	71	15	45.0	3.57
Woodstock †	72	18	44.0	2.98
Massachusetts.				
Amherst (1)	71	6	38.9	3.91
Amherst (2)	70	6	40.8	4.50
Beverly Farms	64	9	38.5	7.13
Blue Hill Obs'y (1)	69	9	40.2	8.23
Blue Hill Obs'y (2)	71	12	41.7	9.16
Blue Hill Obs'y (3)	72	13	41.7	9.70
Cambridge (1)	68	10	42.9	7.46
Cambridge (2)	68	10	40.8	7.70
Chestnut Hill	72	11	42.5	8.17
Clinton	.....	.....	.....	5.85
Cotuit	65	20	44.5	6.14
Deerfield (1)	72	4	38.2	4.30
Deerfield (2)	73	5	38.5	.....
Dudley †	71	7	39.2	5.68
Fall River (1)	65	14	43.1	9.20
Fall River (2)	66	12	44.0	10.73
Framingham	72	8	41.7	7.64
Fiskdale	.....	.....	.....	3.82
Fitchburg (1)	68	7	38.3	6.28
Fitchburg (2)	70	9	38.3	6.43
Fort Warren e	65	13	39.3	3.93
Gilbertville	65	2	36.1	5.18
Groton (1)	68	5	39.6	5.32
Groton (2)	74	7	40.9	.....
Heath	.....	.....	36.5	.....
Holyoke	70	9	41.3	3.38
Lake Cochituate	75	7	41.5	7.03
Lawrence	70	9	39.8	6.16
Leicester	68	9	38.7	3.92
Leominster	.....	.....	.....	5.92
Long Plain	78	8	.....	11.47
Lowell	69	10	40.8	5.98
Ludlow	68	6	38.3	5.08
Lynn	66	12	41.2	8.13
Mansfield	68	11	41.2	10.18
Medford	.....	.....	.....	6.30
Middleborough	68	14	42.4	10.23
Milton †	67	15	42 3	9.51
Monson	70	2	39.4	5.25
Mount Nonotuck	.....	.....	.....	4.76
Mystic Lake	.....	.....	.....	7.02
Mystic Station	.....	.....	.....	6.47
New Bedford (1)	62	15	43.0	7.22
New Bedford (2)	64	16	44.0	7.24
Newburyport (1)	72	11	41.2	6.74
Newburyport (2)	.....	.....	.....	5.51
Northampton	68	8	39.4	5.41
Plymouth	68	23	45.2	7.96
Princeton	66	4	37.3	6.22
Provincetown	62	20	45.0	4.45
Rowe	66	1	34.6	6.30
Royalston z	.....	.....	41.1	4.12
Salem (1)	70	14	41.2	.....
Salem (2)	.....	.....	.....	6.63
Somerset †	68	14	44.4	8.15
South Hingham	.....	9	.....	9.64
Springfield	71	8	40.7	4.08
Taunton (1)	70	15	43.6	9.25
Taunton (2)	69	14	42.8	9.55
Taunton (3)	68	11	43.0	8.88
Waltham	.....	.....	.....	9.16
Warwick	67	2	36.8	.....
Wellesley	71	9	40.4	7.72
Westborough	73	14	43.0	6.31
Massachusetts—Con.				
Winchester	.....	.....	.....	6.68
Worcester	72	10	40.4	.....
Michigan.				
Adamsville	.....	.....	.....	2.25
Adrian	76	15	38.4	2.87
Albion	73	22	41.3	2.06
Allegan	.....	.....	.....	2.69
Alma	71	14	37.1	3.37
Arbela	.....	.....	.....	2.96
Atlantic	54	10	31.1	0.82
Bear Lake	66	16	37.3	1.89
Bell Branch	72	19	38.9	2.65
Benton Harbor †	64	19	38.7	3.02
Benzonia	65	15	36.8	2.14
Berlin	73	16	39.5	3.20
Berrien Springs	.....	.....	.....	2.74
Big Rapids	68	7	36.9	2.80
Birmingham	72	18	37.9	3.42
Bronson	72	18	39.6	2.12
Buchanan	72	18	38.5	2.86
Calumet	54	10	31.4	2.17
Cassopolis	73	21	40.7	2.65
Chase	66	5	35.5	1.24
Chelsea	70	20	40.2	.....
Clinton	.....	.....	.....	2.69
Colon	72	19	39.0	2.37
Columbia	.....	.....	.....	3.13
Concord	72	18	38.2	2.51
Corunna	73	12	39.0	5.80
Courtland	.....	.....	.....	2.81
Deer Lake	70	6	36.5	2.32
East Saginaw	78	16	36.5	3.13
Eden	72	16	38.8	2.07
East Tawas	72	8	40.2	.....
Fitchburgh	.....	.....	.....	2.98
Fletcher	62	6	35.0	1.81
Fort Brady	48	0	31.3	3.31
Fort Mackinac	55	12	34.4	.....
Fremont	62	20	38.7	2.29
Gaylord	60	— 2	31.4	2.21
Grand Rapids	71	17	40.2	.....
Grape	.....	.....	.....	3.28
Gull Lake	53	11	34.4	3.21
Hanover	72	19	40.1	3.01
Harrisville	64	10	36.5	3.13
Hart	68	14	37.9	2.25
Hastings	70	18	39.3	2.93
Hayes	.....	.....	.....	2.02
Highland Station	68	20	39.3	2.57
Hillman	60	1	.....	1.41
Hillsdale	.....	.....	.....	2.44
Hudson	74	15	37.4	2.64
Ionia	70	13	38.1	3.02
Irvin	.....	.....	.....	2.25
Kalamazoo	68	22	40.1	2.49
Kenockee	.....	.....	.....	3.12
Lansing	71	14	39.0	3.33
Lathrop	54	3	31.2	0.95
Madison	74	18	38.4	3.14
Manchester	.....	.....	.....	3.45
Marshall	72	19	40.0	2.71
May	69	16	36.6	3.31
Mio	65	6	34.7	2.85
Montague	.....	.....	.....	1.05
Mottville *	75	16	38.8	2.57
Noble	.....	.....	.....	2.00
Olivet	70	14	38.5	2.54
Ovid	70	14	37.5	2.92
Petersburgh	75	20	40.8	3.77
Pontiac	68	22	41.4	2.77
Pulaski	73	20	39.9	2.72
Romeo	66	22	40.2	.....
Saint Johns	71	17	38.6	3.02
Sand Beach	66	18	39.4	3.15
Stockbridge	.....	.....	.....	2.75
Thornville *	72	18	39.3	3.11
Traverse City	67	8	37.0	2.73
Vienna	.....	.....	.....	2.07
Washington	73	17	38.0	3.13
West Branch	63	7	36.8	3.30
Williamston	68	20	42.2	3.65
Ypsilanti (1)	.....	22	39.3	3.35
Ypsilanti (2)	72	16	39.2	4.18
Minnesota.				
Alexandria	.....	.....	.....	0.35
Farmington	72	6	34.2	0.21
Fergus Falls	.....	.....	.....	0.19
Fort Ripley	.....	.....	.....	0.20
Fort Snelling	67	3	35.5	0.10
Grand Meadow	70	10	32.2	0.29
L. Winnibigoshish	55	2	29.6	0.77
Leech Lake	53	— 7	27.5	0.70
Le Sueur †	70	1	33.5	0.14
Mankato	70	8	35.8	0.20
Medford	70	— 4	31.9	0.15
Minneapolis †	65	4	33.0	0.45
Morris	57	0	30.1	0.07
Northfield	70	3	34.3	0.28
Ortonville	.....	.....	.....	0.00
Pine River	52	— 4	29.6	2.37
Pokegama Falls	54	— 9	26.3	1.16
Red Wing	68	5	34.3	0.24
Redwood Falls	.....	.....	.....	0.34
Rochester	60	3	32.9	0.27
Rolling Green	65	12	33.2	0.04

Meteorological record of voluntary observers, &c.—Continued.

Stations.	Temperature. (Fahrenheit.) Max.	Min.	Mean	Precip'n.
Minnesota—Cont'd.	°	°	°	*Ins.*
Saint Cloud	39	3	33.3	.....
Mississippi.				
Artonish Plantation	86	30	56.0	1.73
Biloxi	79	37	59.4	2.22
Canton	70	32	52.0	1.79
Lamar	78	30	56.0	.....
Logtown	80	36	60.0	.....
Palo Alto	80	29	53 4	3.31
Pearlington	80	38	60.0	.....
Starkville	77	31	54.0	3.60
Water Valley	.....	.....	.....	3.68
Yazoo City	.....	.....	.....	1.58
Missouri.				
Arlington	.....	.....	.....	4.70
Carthage	.....	.....	.....	4.28
Conception	76	18	37.6	2.22
Excelsior Springs *†	82	12	36.0	2.25
Fayette	80	20	43.1	2.65
Fox Creek	82	24	41.9	3.31
Frankford *†	78	15	.....	3.14
Glasgow	79	20	40.8	2.59
Grand Pass	.....	.....	42.9	2.12
Harrisonville	78	21	38.4	2.66
Hermann	.....	.....	.....	3.52
Ironton	74	17	37.3	4.80
Kirksville	78	20	40.7	1.86
Lakenan *†	78	28	40.6	3.75
Lamonte	85	28	44.7	2.95
Langdon	.....	.....	.....	1.00
Maryville	.....	21	33.9	2.00
Mexico	79	22	.....	2.95
New Frankfort †	65	25	37.9	4.35
Oak Ridge	.....	.....	.....	5.20
Oakwood	.....	.....	.....	3.22
Oregon	78	20	42.0	2.75
Ozark	81	22	45.0	4.65
Princeton	78	19	39.7	2.60
Saint Charles (1)	.....	.....	.....	2.50
Saint Charles (2)	80	25	45.8	3.11
Savannah	.....	.....	.....	2.60
Sedalia	80	22	45.9	2.28
Shelbina	.....	.....	.....	2.80
Steelville	82	16	.....	3.70
Wither's Mill	.....	.....	.....	2.70
Montana.				
Fort Assinaboine	61	— 6	29.2	0.06
Fort Custer	64	—12	26.5	0.40
Fort Keogh	58	—17	27.8	0.23
Fort Maginnis	68	3	35.5	.....
Fort Missoula	50	5	30.5	0.03
Fort Shaw	60	— 4	35.1	0.03
Sheldon †	50	4	33.1	0.05
Virginia City	48	— 1	27.4	1.28
Nebraska.				
Ansley	.....	.....	.....	T.
Ashland	78	12	.....	0.06
Creighton	73	4	31.6	0.60
Culbertson *†	80	6	38.8	0.25
David City	70	6	.....	.....
De Soto *	77	14	37.0	0.13
Fairbury	.....	.....	.....	0.15
Falls City	77	18	37.0	1.93
Fort Niobrara	56	4	28.7	0.10
Fort Robinson	65	9	36.7	0.46
Fort Sidney	70	— 3	29.2	T.
Fremont †	75	12	35.7	0.08
Genoa	74	10	35.4	0.20
Hay Springs	70	3	30.1	0.33
Kimball	71	1	34.8	T.
Lincoln	75	15	38.6	0.19
Marquette *†	73	16	.....	T.
Minden	68	14	37.2	0.10
Nebraska City	76	15	36.4	0.41
North Loup	72	9	31.2	.....
Palmer	70	10	31.8	0.00
Ravenna	71	12	.....	0.09
Red Willow	.....	.....	.....	0.28
Sargent	72	6	33.0	0.00
Syracuse †	74	16	38.5	1.18
Weeping Water	75	9	36.3	1.00
West Hill	75	10	33.7	0.10
West Point	75	.....	.....	0.30
Nevada.				
Austin	64	11	.....	0.60
Battle Mountain	.....	.....	35.1	0.82
Brown	.....	.....	44.7	0.33
Burner's Ranch	.....	.....	.....	4.20
Crane's Ranch	.....	.....	.....	0.96
Dayton	71	16	.....	1.69
El Dorado	80	.....	.....	0.85
Elko	73	0	.....	0.51
Ely	60	7	.....	0.90
Eureka	62	18	.....	0.56
Fort McDermit	65	15	39.2	0.04
Genoa	65	18	.....	0.27
Golconda	.....	.....	51.7	0.25
Hot Springs	.....	.....	41.6	0.23
Humboldt	.....	.....	40.4	1.20
Lewer's Ranch	68	18	38.8	2.84
Mill City	.....	.....	42.6	.....
Palisade	.....	.....	36.3	0.37
Reno State Univ'y	69	17	39.8	1.95
Rioville	.....	.....	.....	1.29
Tuscarora	60	5	.....	.....
Wellington	60	17	.....	1.66
New Hampshire.				
Antrim	.....	.....	.....	7.14
Belmont	.....	.....	.....	4.52
Berlin Falls	74	— 8	32.4	.....
Berlin Mills (1)	.....	.....	35.7	6.08
Berlin Mills (2)	.....	— 9	30.1	6.04
Bristol	.....	.....	.....	5.61
Concord	74	3	38.6	4.17
Hanover	65	0	35.1	5.14
Lake Village	.....	.....	.....	6.69
Manchester (1)	73	3	38.9	4.17
Manchester (2)	70	4	38.1	4.53
Mine Falls	.....	.....	.....	4.73
Nashua	71	5	39.5	4.37
Pennichuck Sta	.....	.....	.....	4.24
Plymouth	69	2	33.1	5.28
Shaker Village *	68	5	37.8	2.72
Stratford	70	— 2	34.6	5.54
Walpole	66	— 2	33.2	5.37
West Milan	78	— 8	32.3	5.85
Wier's Bridge	.....	.....	.....	5.66
Wolfborough	.....	.....	.....	5.69
New Jersey.				
Beverly	75	17	45.8	4.15
Billingsport L. H.	74	21	47.1	.....
Bridgeton	74	26	49.2	2.71
Cape May C. H.	72	27	48.6	.....
Clayton *	75	22	46.4	3.11
Egg Harbor City	74	22	45.9	3.19
Freehold	77	18	45.4	3.87
Gillette	77	12	43.9	3.01
Hanover	66	8	40.8	3.31
Highland Park	72	14	44.1	4.37
Hopewell	.....	.....	.....	5.06
Imlaystown	77	17	45.3	4.15
Jersey City	71	17	45.7	.....
Lambertville	71	18	44.5	3.85
Locktown	71	13	43.6	3.33
Moorestown	75	17	45.3	4.04
New Brunswick (1)	70	17	.....	4.29
New Brunswick (2)	72	15	45.2	4.37
Newark	70	18	45.3	4.90
Ocean City	69	22	48.1	4.60
Oceanic	73	25	48.7	4.98
Paterson	72	15	45.2	2.66
Plainfield	74	14	44.1	4.71
Rancocas	76	16	44.5	4.74
Readington * †	74	20	48.9	.....
Somerville	71	15	44.6	3.19
South Orange	73	15	43.8	4.85
Tenafly	77	10	43.7	3.82
Tom's River	71	25	46.6	3.71
Trenton	76	20	.....	5.41
Union	70	15	43.4	3.87
New Mexico.				
Coolidge	.....	10	.....	0.40
Fort Bayard	75	27	50.0	2.05
Fort Seldon	81	20	49.7	8.13
Fort Union	65	5	36.6	0.92
Fort Wingate	60	14	38.1	0.76
Gallinas Spring	71	29	45.7	2.18
Las Vegas	68	4	33.1	3.20
New York.				
Angelica † m	61	6	30.0	1.11
Ardenia †	69	11	43.4	3.06
Auburn	64	20	41.3	4.60
Barnes Corners	.....	.....	31.8	5.35
Boyd's Corners * †	70	10	42.5	4.49
Central Park	72	17	45.4	4.04
Constableville	.....	.....	.....	5.12
Canton †	65	0	32.3	6.04
Cooperstown †	68	11	37.7	3.09
David's Island	65	12	44.4	3.00
Eden	66	10	40.9	4.96
Factoryville †	61	10	39.1	2.70
Fort Columbus	69	17	45.7	5.12
Fort Hamilton	63	17	45.1	4.04
Fort Niagara	71	18	42.5	.....
Fort Wadsworth	71	23	44.9	5.69
Friendship	73	8	38.2	1.52
Geneva	.....	8	40.6	2.42
Hess Road St'n * †	72	16	41.1	9.02
Humphrey	74	12	38.2	2.60
Ilion †	72	8	38.1	3.24
Ithaca	70	8	39.6	3.93
Johnstown	.....	— 5	.....	2.67
Lowville †	60	— 2	29.5	.....
Lyons	71	10	40.0	3.15
Madison Barracks	69	3	37.9	7.13
Middleburgh	75	5	41.0	2.90
Nineveh	62	8	38.1	.....
North Hammond	68	8	37.0	3.42
Palermo *	72	7	37.6	3.45
Potsdam	.....	.....	36.4	7.29
Palmyra * †	72	10	40.4	.....
Pendleton Centre * †	.....	15	37.0	.....
Penn Yan	.....	.....	.....	2.37
Perry City *	.....	.....	37.2	.....
Plattsburgh B'ks	66	3	36.5	3.90
Queensbury † i	.....	1	30.1	4.12
Rose †	70	8	37.6	3.74
Savona	72	7	38.5	2.35
Setauket *	67	21	45.8	4.83
South Canisteo * †	74	12	39.8	.....
Utica	70	5	37.6	4.85
Waddington	.....	.....	31.8	.....

Meterological record of voluntary observers, &c.—Continued.

Stations.	Temperature. (Fahrenheit.) Max.	Min.	Mean	Precip'n.
New York—Cont'd.	°	°	°	*Ins.*
Wedgewood †	73	11	38.8	2.40
West Point	67	7	41.2	.....
White Plains	68	11	44.8	5.00
North Carolina.				
Chapel Hill	84	29	51.6	2.57
Hot Springs	75	25	49.7	.....
Lenoir	.....	.....	48.6	5.10
Mount Pleasant	76	26	50.1	1.69
Monroe	78	29	51.5	1.70
New Berne	90	31	61.4	3.60
Salisbury	75	30	51.6	2.09
Statesville*	76	28	49.0	2.88
Weldon	80	30	51.2	3.65
Ohio.				
Akron	71	19	41.3	4.20
Ashland	.....	.....	.....	3.58
Athens	75	20	43.5	5.03
Bangorville	70	17	41.0	5.33
Bellevue †	74	22	41.5	5.37
Celina	74	21	43.6	4.80
Circleville	.....	.....	.....	4.42
Clarksville	72	24	43.9	4.42
Cleveland	74	24	43.2	4.26
College Hill	74	26	46.3	6.12
Collinwood† b	.....	22	43.1	4.32
Dayton	71	21	44.0	5.52
Demos	70	22	42.7	2.95
Ellsworth	.....	.....	.....	4.14
Elyria	74	21	43.6	3.89
Fostoria	75	23	43.3	4.32
Garrettsville	73	15	39.4	3.66
Georgetown	70	24	44.7	5.46
Gracey	.....	.....	42.1	3.30
Greenville	70	22	42.3	5.53
Hanging Rock	75	20	44.5	2.81
Hiram	70	18	40.9	3.62
Hudson	.....	.....	.....	4.69
Jacksonborough	70	22	42.5	4.65
Jefferson	75	19	40.7	4.66
Logan	76	19	43.5	4.26
Lordstown	72	19	41.8	3.12
Marietta	77	23	44.4	4.07
McConnelsville	76	20	43.3	4.81
Napoleon	75	24	43.6	4.71
New Alexandria	72	20	42.6	4.30
New Athens	69	20	41.7	0.30
New Comerstown	72	20	41.2	4.69
North Lewisburgh	76	19	42.9	5.75
Oberlin	72	21	41.5	2.55
O. S. University	72	19	42.6	4.30
Ottawa	.....	.....	.....	4.80
Pomeroy	75	24	47.8	3.42
Portsmouth	80	26	46.6	3.39
Ruggles* †	68	22	41.8	4.30
Sidney	71	22	43.1	5.26
Springborough	.....	.....	.....	1.99
Tiffin †	71	24	42.7	3.30
Upper Sandusky	72	22	43.2	4.01
Wapakoneta	73	19	42.3	2.24
Wauseon	76	20	40.1	4.06
Waynesville	.....	.....	.....	5.11
Westerville	71	22	42.2	4.34
West Milton†	74	24	46.8	9.52†
Weymouth	.....	.....	.....	4.28
Wooster	.....	21	40.8	4.95
Yellow Springs	70	20	42.9	4.92
Youngstown	78	20	43.2	3.39
Oregon.				
Albany	60	30	45.2	4.13
Bandon* †	64	27	51.5	5.21
East Portland*	57	30	.....	4.00
Eola †	56	30	43.7	4.30
Fort Klamath	69	11	36.7	1.87
McMinnville	60	26	43.3	4.48
Mount Angel	58	29	44.1	5.01
Pennsylvania.				
Altoona	73	20	45.4	2.45
Bethlehem	73	14	45.0	3.82
Carlisle	77	19	44.3	2.88
Catawissa	77	19	45.6	3.79
Chambersburgh	70	16	37.5	2.88
Coatesville	76	16	43.1	3.36
Columbus	74	12	40.6	3.81
Corry	74	12	39.4	3.81
Coudersport	73	10	39.3	2.10
Dyberry	72	8	37.6	4.61
Eagle's Mere	65	4	37.0	6.22
East Brook †	70	19	.....	.....
Easton	.....	.....	.....	3.79
Emporium	73	12	40.2	2.56
Franklin *	.....	.....	38.5	3.98
Germantown	70	16	44.2	3.87
Girardville	70	11	42.1	4.90
Grampian Hills	70	14	37.8	3.86
Greenville	74	16	35.3	5.17
Hollidaysburgh	77	14	41.6	3.05
Honesdale	67	9	38.0	3.97
Huntingdon	77	12	41.8	2.95
Indiana	73	16	43.3	2.75
Lancaster	75	17	44.1	2.97
Lebanon	74	17	43.2	3.26
Lock Haven	69	14	40.9	4.59
Meadville (1) †	70	.....	.....	3.41
Meadville (2)	79	22	44.2	3.22
McConnellsburgh	74	18	42.6	3.14

Stations.	Temperature. (Fahrenheit.) Max.	Min.	Mean	Precip'n.
Pennsylvania—Con.	°	°	°	*Ins.*
New Bloomfield	64	14	42.3	2.89
New Castle	75	17	43.2	3.99
Philipsburgh	74	10	37.9	3.57
Pottstown	73	18	46.0	3.42
Quakertown	73	11	42.6	3.71
Reading	74	14	43.3	4.06
Rimersburgh	68	15	40.0	3.55
Salem Corners†	61	19	38.7	3.80
Scranton	70	13	42.0	4.36
Selins Grove	73	16	44.7	2.40
Shamokin	75	25	47.9	1.99
Smethport	74	10	39.3	4.01
Somerset	72	15	39.0	2.74
State College	72	12	41.2	2.71
Swarthmore	74	18	48.0	4.13
Troy	70	10	40.1	2.55
Uniontown	76	22	44.7	3.36
Wellsborough †	76	6	39.8	3.68
West Chester	72	16	44.2	3.94
Wysox	62	10	39.7	3.27
York	76	20	44.0	2.68
Rhode Island.				
Bristol	61	14	43.4	6.76
Fort Adams	.....	16	.....	.....
Kingston	.....	.....	.....	9.57
Lonsdale	.....	.....	.....	8.38
Newport	60	18	44.0	.....
Olneyville	80	12	46.0	.....
Pawtucket	.....	.....	.....	8.56
Providence (1)	68	14	43.9	9.02
Providence (2)	72	10	42.7	8.24
Woonsocket	66	11	41.2	6.82
South Carolina.				
Abbeville	75	30	52.1	1.56
Aiken	78	32	54.9	2.15
Brewer's Mines	80	30	53.5	1.83
Cedar Springs	80	22	46.3	3.30
Cheraw	80	31	.....	1.15
Clinton	77	37	51.1	2.23
Columbia	82	30	51.3	2.28
Conway	.....	.....	50.8	7.50
Florence	80	39	57.1	.....
Hardeeville	81	29	.....	2.73
Kirkwood †	70	25	49.5	1.50
Newberry	78	29	51.8	3.10
Spartanburgh	76	29	.....	2.40
Statesburgh	76	32	53.5	1.76
Timmonsville	76	.....	.....	2.48
Trial	.....	.....	52.0	3.31
Winnsborough	79	28	54.3	1.32
Yorkville	79	28	53.0	2.27
Tennessee.				
Andersonville	75	24	48.8	3.40
Ashwood†	77	26	49.7	6.06
Austin	78	24	52.2	3.03
Covington	76	31	49.4	3.95
Fayetteville	76	26	51.3	4.43
Florence Station	73	28	50.3	4.41
Fostoria	73	24	48.7	4.20
Greeneville	74	26	47.9	2.35
Hohenwald	80	19	47.8	5.03
Jacksborough	72	25	48.6	5.08
Kingston Springs	78	24	49.8	3.75
Lawrenceburgh	77	19	46.7	.....
Leeville	78	27	50.6	3.62
Lookout Mountain	70	30	48.8	2.30
McKenzie	80	28	50.6	4.75
Milan	79	26	48.2	4.66
Nunnelly	76	22	49.0	3.90
Parksville	76	26	51.9	3.01
Riddleton	75	23	49.0	4.36
Rogersville	71	26	49.1	3.52
Savannah	80	26	50.9	5.67
Springdale	80	22	47.1	3.67
Trenton	76	28	47.6	5.16
Watkins	75	26	49.6	3.81
Waynesborough	86	23	48.6	5.28
Texas.				
Austin	84	35	56.6	6.61
Belton	83	31	53.3	5.60
Brady	81	24	46.2	3.12
Cedar Hill †	80	36	54.6	5.00
Brenham	87	39	58.8	6.68
Cleburne	.....	.....	.....	2.37
College Station	88	35	54.0	5.27
Columbia	86	32	60.6	4.84
Corsicana (1)	86	32	54.0	5.40
Corsicana (2)	.....	.....	.....	3.82
Decatur	84	32	49.3	3.69
Fort Clark	88	19	52.7	2.03
Fort Concho	90	26	53.1	2.20
Fort Davis	79	27	49.1	0.98
Fort Elliott	85	21	44.7	0.76
Fort McIntosh	86	36	59.5	0.51
Fort Ringgold	92	30	63.9	0.92
Gallinas	89	31	56.6	3.83
Granbury †	85	31	50.9	3.17
Houston	86	34	59.1	6.26
Huntsville	89	33	58.0	4.84
Lampasas	84	22	51.1	3.85
Longview	85	31	55.5	5.40
Mesquite	86	30	51.3	4.34
Mexia	83	32	52.8	6.66
New Ulm	87	36	57.1	5.34
Silver Falls † e	84	26	45.5	4.68

Meterological record of voluntary observers, &c.—Continued.

Stations.	Temperature. (Fahrenheit.) Max.	Min.	Mean	Precip'n.
Texas—Cont'd.	°	°	°	*Ins.*
Tyler	85	31	54.0	4.10
Waco	84	21	53.5	3.00
Vermont.				
Brattleborough (1)	72	4	38.7	5.65
Brattleborough (2)	74	8	38.4	.....
Burlington	68	2	37.3	3.60
Cornwall	.....	.....	.....	3.28
Chelsea	64	— 1	33.6	4.28
Coventry†	66	— 4	33.4	4.83
East Berkshire	67	— 3	33.3	6.40
Jacksonville	72	1	35.3	6.92
Lunenburgh	58	0	37.2	4.84
Manchester †	70	4	38.0	6.70
Middlebury * †	64	1	35.8	3.59
Saint Johnsbury †	64	0	34.4	2.65
Strafford* †	66	0	35.4	6.20
Vernon	72	4	39.3	5.43
Virginia.				
Bird's Nest* †	78	30	50.1	3.60
Christiansburgh	65	22	43.6	1.48
Dale Enterprise *	78	21	49.6	2.73
Fort Monroe	79	30	52.3	1.49
Marion c	72	20	42.6	1.08
Petersburgh d	73	30	49.2	3.51
Spottsville*	75	31	51.2	3.80
Summit*	72	22	44.4	.....
University of Va	.....	.....	.....	4.65
Wytheville	71	22	45.1	2.20
Washington Territory				
Blakeley	58	26	44.0	5.33

Stations.	Temperature. (Fahrenheit.) Max.	Min.	Mean	Precip'n.
Wash. Ter.—Cont'd.	°	°	°	*Ins.*
Fort Spokane	55	14	36.6	0.72
Fort Townsend	54	25	43.0	1.48
Fort Walla Walla	61	17	39.5	0.46
Tacoma †	55	28	44.3	6.34
Vancouver B'ks	59	23	42.0	.....
West Virginia.				
Hartmonsville* †	65	15	38.8	.....
Helvetia* †	72	18	42.6	2.97
Middlebrook †	69	16	38.5	.....
Parkersburgh	75	22	44.0	6.27
Tyler Creek †	78	22	47.9	.....
White Sulph. Sp'gs.	.....	.....	.....	1.54
Wisconsin.				
Cadis †	.....	20	35.2	.....
Deuster d	69	2	34.7	.....
Fond du Lac	67	9	35.2	2.63
Fredonia * † f	61	10	35.2	.....
Lincoln	.....	.....	39.0	1.04
Madison	67	14	37.3	1.32
Manitowoc	62	11	38.9	1.61
Waucousta	.....	6	.....	0.50
Weston	.....	.....	31.9	3.75
Wyoming.				
Camp Sheridan	44	— 4	26.7	.....
Camp Pilot Butte	59	— 3	29.3	.....
Fort Bridger	.....	9	.....	0.62
Fort D. A. Russell	.....	6	.....	.....
Fort Laramie	68	.....	.....	0.08
Fort McKinney	59	6	35.3	0.25
Fort Washakie	62	— 6	26.3	0.75

Reports received too late for publication in the October Weather Review.

	°	°	°	*Ins.*
California.				
Anderson	90	46	63.0	0.00
Colegrove	.....	.....	.....	0.71
Fort Bidwell	81	26	53.0	0.22
Fort Gaston	87	27	56.1	0.61
Fort Mason	.....	.....	59.2	0.04
Nicolaus	90	44	65.6	.....
Riverside	98	43	66.9	0.10
Hydesville	75	36	55.7	0.74
Florida.				
St. Francis Bar'ks.	84	53	71.6	4.00
Georgia.				
Athens	78	40	56.9	5.09
Indiana.				
Laconia †	76	32	51.3	2.45
Iowa.				
Humboldt †	73	22	43.3	2.02
Sac City †	72	27	45.7	1.20
Wesley	73	22	43.7	0.87
Kentucky.				
Carlisle h	76	28	47.9	3.32
Louisiana.				
Lulingt b	84	56	65.4	5.64
Mexico.				
Leon de Aldamas	80	42	64.7	1.95
Mazatlan	88	72	83.1	2.15
Central Observ'tory	72	45	59.4	1.37
Missouri.				
Pierce City †	84	28	55.4	4.00
Nebraska.				
Lincoln	80	26	50.9	1.84
Kimball	79	14	48.2	0.10
New York.				
Waddington	.....	.....	39.8	.....
Pennsylvania.				
East Brook †	68	30	.....	.....
Virginia.				
Petersburgh f	74	35	54.2	3.10
Wisconsin.				
Oshkosh	71	25	43.2	1.23

† Maximum and minimum from observed readings. The letters of the alphabet denote number of days missing in record.

TEMPERATURE OBSERVATIONS AT PHILADELPHIA.

Mr. Lorin Blodget, of the Franklin Institute, Philadelphia, kindly furnishes the following interesting details concerning the 111 years of temperature observations for Philadelphia and vicinity published in the REVIEW for May, 1888:

1758–1859, from manuscript in the possession of the American Philosophical Society. Observer's name not given. See Blodget's Climatology, pp. 67, 70.

1767–1777, from the 4th volume of the Transactions of the American Philosophical Society, 1839. Observer's name not given. See Blodget's Climatology, pp. 67, 70.

1790–1797, by Charles Pierce, at Morrisville, Bucks Co., 25 miles north of Philadelphia.

1798–1804, by Dr. John R. Coxe. Manuscript now in possession of Mr. Blodget, as given him by Dr. Coxe.

1805–1806, by Charles Pierce, Morrisville, Bucks Co., Pa.

1807–1826, by James Young, corner Second and Dock streets, Philadelphia, and first published in Darby's View of the United States. Hours not known, but chiefly mid-day. Means 3° to 5° too high.

1827–1828, by Charles Pierce, Morrisville, Bucks Co., Pa.

1829–1838, by Dr. Thomas Hewson. See Blodget's Climatology; also Transactions of the American Philosophical Society for 1839. A very valuable series.

1839–1840, observations printed in the Franklin Institute Journal, Philadelphia. Observer not named.

1841–1845, observations at Girard College, Philadelphia; badly taken, as I know from observers themselves. They are much too low generally, and of no value for constants.

1846–1851, observations at the Pennsylvania Hospital, Eighth and Spruce Streets, Philadelphia.

1852–1871, by Prof. James A. Kirkpatrick, Central High School. Hours, 7, 2, 9. The last five years of this series, 1875–1881, are too high by 3° for each year; others very good.

1872–1887, observations at the United States Signal Service station.

The earlier series are discrepant, but to some extent compensating when made up in a general mean, so that the figures at the foot of the table are nearly correct.

The true mean is best given in the Pennsylvania Hospital series (64 years), carefully made under uniform conditions. The Signal Service observations seem too low for the true mean at the surface; it agrees closely, however, with the hospital mean for the whole period of 17 years.

The daily extremes form the best data generally. In Major Mordecai's valuable report of hourly observations at the Frankfort Arsenal, 1835–1843, the hourly constants are very accurately determined.

I examined all the series taken at and near Philadelphia in 1851–1857 very thoroughly, many of them coming into my posession in manuscript.

Charles Pierce, at Morrisville, Bucks county (near Bordentown, N. J.), kept a long and valuable series, passing into the hands of Ebenezer Hance, at Fallsington, three miles west of Morrisville.

A valuable series of observations was kept at the Philadelphia Health Office from 1807 to 1828, but I have not been able to get all the details.

Table of miscellaneous meteorological data for November, 1888—Signal Service observations.

Stations and districts.	Elevation above sea-level, feet.	Atmospheric pressure, in inches and hundredths. Mean actual barometer.	Departure from normal.	Mean reduced barometer.	Extremes. Highest barometer.	Date.	Lowest barometer.	Date.	Monthly range of barometer.	Temperature of the air, in degrees Fahrenheit. Monthly mean. (8 a.m. and 8 p.m.)	Departure from normal.*	Extremes. Max.	Date.	Mean max.	Min.	Date.	Mean min.	Monthly range.	Daily ranges. Greatest.	Date.	Least.	Date.	Mean relative humidity, per cent.	Mean temperature of dew-point, degrees Fahrenheit.	Precipitation, in inches.	Departure from normal precipitation, in inches.	Winds. Total movement, miles.	Prevailing direction.	Maximum velocity. Miles p. h.	Direction.	Date.	No. of rainy days.	No. of cloudy days.	No. of fair days.	No. of clear days.
New England.										41.6	+ 0.9														5.84	+ 1.70									
Eastport	53	30.04	+.13	30.10	30.81	18	29.42	11	1.39	36.8	+ 0.1	63.8	1	43.2	5.0	23	31.0	58.8	23.5	19	3.7	25	79.0	30.6	6.70	+ 2.15	9,673	nw.	64	ne.	26	13	14	3	13
Portland	99	29.99	+.09	30.10	30.80	18	29.42	10	1.38	37.8	− 0.8	66.6	1	45.1	7.0	23	31.2	59.6	29.5	14	3.1	10	80.0	31.8	7.46	+ 3.59	6,819	sw.	38	n.	25	14	14	8	8
Manchester	247	29.86	.....	30.12	30.82	18	29.44	10	1.38	37.6	......	72.7	1	47.6	5.5	23	30.9	67.2	37.5	14	3.8	27	77.0	30.6	3.66	....	4,786	nw.	30	ne.	26	11	11	8	11
Northfield	871	29.14	.....	30.11	30.79	18	29.45	10	1.34	34.3	......	69.5	2	41.8	− 1.0	23	26.3	70.5	33.5	14	3.5	27	83.1	29.2	3.82	....	6,945	s.	36	w.	20	16	21	7	2
Boston	125	29.98	+.08	30.12	30.83	18	29.44	10	1.39	43.1	+ 1.8	74.0	1	51.2	12.8	23	36.5	61.2	24.2	14	5.0	27	73.8	34.8	4.97	+ 0.11	10,060	sw.	60	ne.	26	14	13	9	8
Nantucket	14	30.09	.....	30.10	30.77	18	29.31	26	1.46	40.2	......	64.5	10	53.0	26.0	23	41.2	38.5	21.0	2	3.9	22	86.9	42.3	6.49	....	9,034	sw.	40	n.	20	15	13	4	13
Wood's Holl	22	30.09	.....	30.11	30.80	18	29.31	26	1.49	44.6	......	60.6	10	50.6	23.5	22	39.9	37.1	21.8	13	3.6	6	80.4	38.4	6.22	+ 0.90	12,786	sw.	49	nw.	11	16	15	6	9
Vineyard Haven	......	......	.....	......	......	..	......	..	....	47.0	......	67.5	9	54.7	22.8	23	39.3	44.7	26.0	19	7.5	28	....	......	3.39	....	......	sw.	...	......	..	16	..	..	..
Block Island	26	30.08	+.05	30.11	30.79	18	29.24	26	1.55	45.6	+ 0.4	64.4	10	50.8	21.0	23	40.0	43.4	21.8	17	4.0	6	84.9	41.4	4.17	− 0.01	15,913	ne.	84	ne.	26	16	13	6	11
Narragansett Pier	22	......	.....	......	......	..	......	..	....	43.5	......	63.0	3	51.2	14.0	23	35.8	49.0	27.0	26	7.0	25	....	......	7.05	+ 4.66	......	ne.	...	......	..	12	..	..	..
New Haven	107	30.01	+.06	30.13	30.81	18	29.30	26	1.51	41.4	+ 2.0	67.1	1	50.0	10.8	23	36.1	56.3	23.1	4	3.7	29	85.6	37.3	4.73	+ 0.86	7,183	ne.	51	ne.	25	13	15	5	10
New London	47	30.05	+.04	30.10	30.78	18	29.26	26	1.52	45.0	+ 1.8	65.0	2	51.4	13.6	23	38.1	51.4	20.3	19	5.5	27	78.1	38.2	5.46	+ 1.33	6,234	ne.	36	ne.	25	13	11	10	9
Mid. Atlantic States.										46.0	+ 1.6														3.48	+ 0.19									
Albany	85	30.04	+.06	30.14	30.80	18	29.44	10	1.36	39.6	− 0.4	69.0	2	47.7	8.5	23	33.4	60.5	32.0	1	6.0	29	80.8	33.9	4.48	+ 1.48	5,599	s.	36	nw.	26	14	14	11	5
New York City	185	29.93	+.05	30.13	30.79	18	29.26	26	1.53	45.2	+ 1.8	72.3	2	53.7	18.0	23	40.0	54.3	23.2	1	4.9	10	75.4	37.5	4.81	+ 1.37	7,805	s.	48	w.	11	12	11	10	9
Philadelphia	117	30.03	+.05	30.15	30.76	18	29.33	26	1.43	45.8	+ 2.4	75.0	6	54.3	18.0	23	40.4	57.0	25.0	1	5.9	25	76.4	38.3	3.77	+ 0.63	8,818	nw.	42	nw.	26	14	20	1	9
Atlantic City	34	30.09	+.03	30.12	30.73	18	29.20	26	1.53	47.0	+ 2.2	69.0	3	52.8	26.0	23	41.6	43.0	23.5	18	4.0	25	84.4	42.4	2.71	− 0.91	8,690	w.	38	n.	25	10	14	8	8
Baltimore	45	30.11	+.04	30.15	30.72	18	29.48	26	1.24	46.8	+ 1.9	74.5	6	54.6	25.0	23	41.2	49.5	27.1	2	2.9	8	71.0	37.2	3.04	− 0.06	4,328	nw.	25	nw.	11	10	16	6	8
Washington City	103	30.05	+.04	30.17	30.73	18	29.53	26	1.20	45.8	+ 0.4	75.3	2	54.9	23.9	22	39.9	51.4	28.7	13	4.7	26	75.0	37.9	2.97	+ 0.12	3,840	nw.	25	nw.	26	10	15	6	9
Cape Henry	......	......	.....	......	......	..	......	..	....	54.6	......	80.4	9	61.8	33.5	26	47.5	46.9	20.4	9	10.0	29	....	......	3.07	− 0.88	......	ne.	...	......	..	9	..	..	..
Lynchburgh	658	29.46	+.03	30.18	30.68	18	29.64	26	1.04	45.6	+ 2.4	76.5	2	59.3	25.7	23	39.4	50.8	37.7	1	10.1	20	71.6	36.4	2.74	− 0.51	4,052	nw.	36	nw.	26	6	8	11	11
Norfolk	69	30.07	−.02	30.14	30.61	18	29.50	26	1.11	52.0	+ 2.5	79.8	9	60.6	33.0	28	46.4	46.8	25.9	1	4.0	25	82.4	46.4	3.71	+ 0.44	7,208	ne.	50	nw.	26	11	16	9	5
Harrisburg	361	29.76	.....	30.16	30.75	18	29.54	26	1.21	42.9	......	74.0	6	50.4	19.0	23	36.8	55.0	28.0	1	4.8	8	76.7	35.5	2.30	....	5,308	ne.	36	n.	26	11	16	7	7
S. Atlantic States.										54.8	+ 0.8														4.44										
Charlotte	808	29.30	+.03	30.16	30.54	18	29.77	26	0.77	48.9	+ 2.0	78.0	8	60.7	30.0	25	43.3	48.0	26.6	6	7.0	20	78.4	42.2	1.69	− 1.90	3,747	n.	23	nw.	25	10	9	4	17
Hatteras	11	30.12	+.02	30.14	30.56	13	29.58	26	0.98	56.8	+ 1.4	74.2	2	61.6	37.7	26	53.1	36.5	17.4	2	4.0	22	87.6	53.0	5.52	+ 0.01	12,326	ne.	66	n.	25	12	12	6	12
Kitty Hawk	......	......	.....	......	......	..	......	..	....	57.9	......	79.5	3	65.8	34.3	29	50.0	45.2	31.0	27	5.2	10	....	......	3.16	− 1.42	......	ne.	...	......	..	15	..	..	..
Raleigh	375	29.75	.....	30.15	30.55	18	29.70	26	0.85	50.0	......	79.0	7	59.9	30.0	23	42.2	49.0	27.5	13	8.0	20	77.8	43.0	3.01	....	4,345	nw.	20	nw.	26	10	11	9	10
Southport	......	......	.....	......	......	..	......	..	....	57.3	......	74.5	7	63.1	35.3	26	51.4	39.2	19.3	26	6.0	8	....	......	6.30	+ 3.30	......	ne.	...	......	..	10	..	..	..
Wilmington	52	30.06	−.02	30.12	30.49	13	29.70	26	0.79	54.2	+ 2.0	79.3	3	63.9	35.8	27	50.0	43.5	22.0	29	4.0	24	82.0	48.5	5.50	+ 3.00	4,864	ne.	34	se.	14	14	14	5	11
Charleston	52	30.06	−.02	30.11	30.39	13	29.81	26	0.58	56.3	− 0.3	79.8	3	64.4	36.4	26	51.0	43.4	21.1	26	4.5	22	85.8	51.8	7.54	+ 4.60	6,896	ne.	46	e.	14	9	16	5	9
Columbia	......	......	.....	......	......	..	......	..	....	53.0	......	80.0	8	62.6	31.0	26	46.7	49.0	25.0	1	3.0	18	83.6	47.8	2.28	....	......	......	...	......	..	7	13	8	9
Augusta	183	29.97	+.01	30.16	30.46	13	29.82	26	0.64	51.6	+ 0.8	80.0	8	63.7	29.0	27	45.9	51.0	29.0	26	3.8	23	81.9	46.0	2.34	− 1.25	3,535	w.	22	ne.	14	10	14	3	13
Savannah	87	30.02	−.03	30.12	30.36	13	29.82	26	0.54	56.0	− 0.2	80.8	3	64.6	36.6	27	50.9	44.2	23.2	11	3.6	15	82.4	50.4	3.74	+ 1.57	5,553	n.	32	ne.	14	13	14	5	11
Jacksonville	43	30.06	−.02	30.11	30.33	1	29.86	27	0.47	59.5	− 0.4	83.3	3	68.8	38.5	26	54.3	44.8	24.1	26	3.5	22	85.5	55.0	4.16	+ 1.50	4,915	n.	26	se.	8	17	14	5	11
Florida Peninsula.										68.2	− 0.4														5.08	+ 2.88									
Titusville	12	30.07	.....	30.08	30.27	1	29.87	27	0.40	65.6	......	84.2	14	73.0	39.0	26	59.4	45.2	27.7	27	4.1	8	86.8	61.3	8.68	....	6,567	nw.	37	w.	9	12	14	5	11
Cedar Keys	22	30.08	−.01	30.10	30.29	1	29.80	27	0.49	61.8	+ 0.4	83.0	1	69.2	42.8	24	57.7	40.2	23.0	12	4.2	22	85.0	57.2	5.43	+ 3.21	7,857	ne.	30	n.	27	12	13	6	11
Key West	22	30.02	−.02	30.04	30.14	30	29.93	27	0.21	74.7	− 1.1	84.0	9	77.8	58.0	26	70.0	26.0	13.9	7	3.8	21	84.2	69.5	4.74	+ 2.54	7,617	e.	32	ne.	17	15	9	12	9
Jupiter	28	30.02	.....	30.04	30.20	1	29.90	27	0.30	70.4	......	83.4	14	76.8	43.3	26	65.0	40.1	22.8	27	3.9	24	83.2	64.9	3.98	....	7,623	nw.	24	e.	13	12	7	10	13
Micco	......	......	.....	......	......	..	......	..	....	62.4	......	84.0	9	73.9	40.9	26	61.3	43.1	22.8	29	6.9	13	....	......	5.11	....	......	nw.	...	......	..	15	..	..	..
Eastern Gulf States.										55.5	+ 1.6														3.16	− 1.36									
Atlanta	1,129	28.95	.00	30.15	30.42	13	29.84	9	0.58	50.0	+ 2.4	77.0	7	59.8	28.4	27	45.0	48.6	23.6	24	4.8	14	76.5	42.3	4.70	+ 0.47	7,091	e.	30	nw.	11	10	8	15	7
Pensacola	56	30.04	−.06	30.10	30.32	24	29.78	8	0.54	58.2	+ 0.9	81.2	3	66.9	34.0	28	52.9	47.2	23.0	25	5.3	21	81.8	52.6	4.71	+ 0.10	6,622	ne.	36	n.	14	7	12	5	13
Mobile	35	30.08	−.02	30.12	30.36	24	29.73	8	0.63	56.9	+ 1.4	82.7	3	67.3	33.5	28	51.4	49.2	23.7	12	5.0	8	83.4	51.9	2.46	− 1.78	4,635	n.	26	se.	8	7	9	15	6
Montgomery	217	29.89	−.03	30.13	30.37	24	29.78	8	0.59	54.8	+ 1.6	81.5	7	64.8	29.7	28	48.4	51.8	27.0	4	3.7	18	74.4	46.4	3.38	− 0.31	3,886	e.	20	w.	9	8	8	11	11
Vicksburg	222	29.88	−.04	30.12	30.41	24	29.61	8	0.80	53.9	+ 1.5	81.3	1	64.9	35.3	26	48.1	46.0	28.2	11	4.7	21	79.6	47.2	2.19	− 3.11	4,094	se.	27	w.	9	11	16	8	6
University	......	......	.....	......	......	..	......	..	....	52.4	......	77.8	6	60.1	28.0	28	44.7	49.8	23.4	4	5.9	8	....	......	4.51	....	......	n.	...	......	..	11	..	..	..
New Orleans	52	30.04	−.03	30.10	30.34	24	29.67	8	0.67	59.1	+ 1.8	84.8	8	68.9	41.0	28	54.8	43.8	20.0	2	4.8	20	79.4	52.4	1.50	− 3.50	5,734	ne.	33	s.	8	10	6	13	11
Auburn	......	......	.....	......	......	..	......	..	....	54.8	......	78.0	6	62.7	29.0	28	49.6	49.0	24.0	12	7.0	19	....	......	4.96	....	......	e.	...	......	..	6	..	..	..
Port Eads	......	......	.....	......	......	..	......	..	....	66.0	......	81.2	2	70.9	49.0	29	61.0	32.2	25.0	10	2.2	29	....	......	3.72	....	......	ne.	...	......	..	8	..	..	..
Western Gulf States.										54.0	− 1.3														5.84	+ 2.00									
Shreveport	249	29.86	−.03	30.12	30.43	24	29.61	8	0.82	53.4	− 1.0	84.2	5	63.4	33.5	30	46.6	50.7	31.7	4	3.6	20	80.8	47.0	3.48	− 1.35	3,960	n.	23	nw.	9	11	14	8	8
Fort Smith	470	29.64	−.03	30.15	30.48	20	29.70	8	0.78	47.0	− 3.2	79.0	1	56.8	28.0	28	40.9	51.0	31.0	4	4.0	16	75.4	39.0	5.54	+ 2.52	3,297	se.	27	nw.	2	11	18	4	8
Little Rock	309	29.81	+.01	30.15	30.47	24	29.60	8	0.87	48.3	− 1.1	81.2	2	57.1	32.0	28	42.7	49.2	26.9	1	2.8	17	81.5	42.4	8.82	+ 4.11	3,976	ne.	24	nw.	9	10	15	8	7
Corpus Christi	20	30.08	−.02	30.10	30.34	21	29.63	7	0.71	60.8	− 0.6	83.2	2	66.7	39.0	9	56.0	44.2	30.3	10	2.4	20	86.4	56.5	8.64	....	8,260	n.	35	nw.	8	10	15	7	8
Galveston	44	30.06	−.02	30.10	30.35	24	29.64	8	0.71	60.6	− 0.4	81.5	2	66.7	42.3	9	56.4	39.2	20.5	10	5.0	21	84.6	55.6	6.73	+ 2.15	6,661	ne.	37	nw.	8	9	12	6	12
Palestine	511	29.59	+.01	30.12	30.40	24	29.65	8	0.75	53.2	− 1.6	87.1	4	64.3	32.0	10	46.6	55.1	39.1	4	4.9	18	84.6	48.4	5.92	+ 1.68	3,953	ne.	22	w.	9	14	15	9	6
San Antonio	781	29.31	+.01	30.14	30.40	21	29.67	7	0.73	54.5	− 1.0	86.0	1	64.5	34.5	9	49.6	51.5	30.8	10	5.0	30	79.5	47.5	4.58	+ 2.91	6,303	ne.	34	n.	8	13	17	7	6
Rio Grande Valley.										62.6	0.0														3.18	+ 1.64									
Rio Grande City	230	29.91	.00	30.16	30.44	21	29.74	7	0.70	61.4	− 0.9	90.2	2	71.8	36.6	10	56.4	53.6	39.4	10	3.7	20	83.4	55.6	1.36	+ 0.40	3,488	n.	28	n.	8	10	15	9	6
Brownsville	57	30.03	−.01	30.09	30.33	21	29.68	7	0.65	63.8	+ 1.0	87.5	3	73.9	44.0	10	60.1	43.5	33.0	10	4.0	29	88.1	60.2	4.99	+ 2.89	5,993	n.	26	nw.	8	14	11	7	12
Ohio Val. & Tenn.										46.4	+ 2.5														4.64	+ 0.88									
Chattanooga	783	29.32	−.01	30.16	30.44	13	29.77	9	0.67	50.6	+ 4.0	77.6	7	61.9	27.0	27	44.1	50.6	29.8	12	5.8	14	77.2	43.2	4.66	+ 0.16	4,137	ne.	28	s.	8	9	12	9	9
Knoxville	980	29.13	+.01	30.18	30.47	13	29.77	9	0.70	47.8	+ 3.0	76.9	7	57.4	26.3	27	42.5	50.6	30.8	1	2.8	30	76.1	40.0	3.19	− 1.09	3,922	ne.	23	sw.	6	7	15	9	6
Memphis	320	29.79	.00	30.14	30.45	24	29.66	8	0.79	49.0	+ 0.7	78.2	1	57.7	31.4	27	43.7	46.8	28.5	4	3.3	9	80.0	42.6	6.53	+ 1.86	4,321	e.	26	sw.	9	11	16	7	7
Nashville	549	29.55	+.01	30.14	30.44	17	29.65	8	0.79	48.0	+ 1.6	76.2	5	57.7	26.0	27	41.6	50.2	31.5	12	3.5	30	78.4	41.0	4.33	+ 0.49	4,163	nw.	33	sw.	2	15	14	11	5
Louisville	551	29.56	+.03	30.16	30.48	20	29.65	8	0.83	47.4	+ 2.6	78.5	1	57.1	25.0	27	40.2	53.5	30.0	13	1.5	10	70.8	37.9	6.34	+ 2.53	5,336	n.	25	sw.	9	12	18	4	8
Indianapolis	766	29.32	+.05	30.16	30.57	20	29.60	8	0.97	42.4	+ 3.0	76.0	1	50.4	25.7	22	37.5	50.3	23.0	4	3.0	10	77.1	35.1	5.07	+ 1.41	4,071	nw.	22	nw.	3	11	19	1	10
Terre Haute	......	......	.....	......	......	..	......	..	....	45.7	......	75.3	1	54.6	24.0	28	36.8	51.3	28.2	3	4.3	30	....	......	6.29	....	......	s.	...	......	..	16	..	..	..
Cincinnati	628	29.47	+.04	30.16	30.51	20	29.66	9	0.85	45.5	+ 2.4	76.4	1	53.7	26.8	21	39.0	49.6	28.9	13	4.9	10	73.9	37.2	4.78	+ 1.56	4,875	se.	32	nw.	6	12	18	4	8
Columbus	812	29.28	+.06	30.17	30.54	20	29.65	9	0.89	42.8	+ 3.1	73.0	1	50.8	23.5	21	37.4	49.5	26.7	13	4.4	30	75.3	34.9	3.26	− 0.05	5,114	s.	30	sw.	10	14	17	5	8
Pittsburgh	847	29.23	+.05	30.14	30.54	17	29.64	10	0.90	44.3	+ 2.3	74.3	9	52.3	24.0	23	38.3	50.3	27.1	13	5.5	29	73.6	35.8	3.57	+ 1.04	3,509	nw.	12	nw.	16	19	16	6	8
Parkersburgh	638	29.48	.....	30.18	30.53	17	29.71	9	0.82	43.2	......	76.0	9	53.0	23.6	24	37.5	52.4	34.2	4	3.2	29	76.2	35.6	4.13	....	3,793	nw.	30	sw.	6	16	14	5	11
Lexington	......	29.03	.....	......	......	..	......	..	....	45.2	......	73.9	5	53.4	25.0	27	38.0	48.9	26.4	4	4.2	26	76.0	37.2	5.15	....	8,304	ne.	48	se.	8	14	18	5	7
Lower lake region.										40.8	+ 2.2														3.21	+ 0.04									
Buffalo	690	29.38	+.10	30.14	30.64	23	29.54	10	1.10	40.2	+ 1.6	67.9	2	45.7	15.0	23	35.6	52.9	22.0	23	3.0	29	79.4	33.6	3.90	+ 0.38	8,351	w.	58	sw.	10	15	17	10	3
Oswego	335	29.75	+.08	30.12	30.71	18	29.52	10	1.19	39.0	+ 0.4	69.2	2	45.5	9.4	23	33.4	59.8	26.4	14	3.0	16	76.6	31.6	3.52	+ 0.33	9,145	s.	36	n.	26	16	19	10	1
Rochester	621	29.45	+.09	30.14	30.69	22	29.57	10	1.12	39.4	+ 2.4	72.6	1	46.9	11.0	23	34.0	61.6	23.4	14	3.0	29	79.2	32.8	2.86	+ 0.11	8,237	w.	34	w.	11	15	17	8	5
Erie	714	29.35	+.04	30.13	30.59	20	29.60	10	0.99	42.0	+ 2.6	74.5	1	49.9	20.5	23	37.2	54.0	24.3	4	4.0	30	76.1	34.2	3.38	− 1.27	9,641	s.	46	se.	8	17	21	6	3
Cleveland	678	29.39	+.07	30.14	30.59	20	29.67	10	0.92	42.6	+ 3.4	74.0	1	49.3	24.0	23	37.6	50.0	25.1	4	4.3	27	72.2	33.7	3.59	+ 0.81	7,290	s.	34	w.	10	17	17	5	8
Sandusky	629	29.45	+.08	30.14	30.59	20	29.67	10	0.92	42.2	+ 3.4	76.0	1	49.1	24.9	23	37.8	51.1	24.4	13	3.0	20	72.2	33.4	2.35	− 0.80	7,809	sw.	36	w.	10	12	18	10	2
Toledo	673	29.41	+.06	30.15	30.62	20	29.65	10	0.97	41.2	+ 2.7	73.5	1	48.9	24.0	26	36.5	49.5	21.8	13	4.3	30	75.4	33.5	3.02	+ 0.16	7,416	w.	36	w.	10	13	18	4	8
Detroit	662	29.42	+.09	30.15	30.64	20	29.63	10	1.01	39.6	+ 1.4	69.6	1	47.4	21.9	21	35.4	47.7	21.0	8	3.3	9	77.8	32.8	3.05	+ 0.57	7,349	nw.	34	e.	8	13	17	3	10
Upper lake region.										36.9	+ 3.4														2.00	− 0.54									
Alpena	609	29.45	+.12	30.13	30.72	20	29.57	10	1.15	34.8	+ 2.2	67.0	2	40.4	12.0	18	29.9	50.0	26.0	2	1.5	22	85.8	30.7	2.13	− 0.83	7,152	w.	30	sw.	6	17	25	3	2
Escanaba	608	......	.....	......	......	..	......	..	....	36.1	......	59.0	3	43.5	8.0	17	28.8	51.0	28.0	3	5.5	28	....	......	0.86	− 1.69	......	nw.	...	......	..	11	..	..	..
Grand Haven	620	29.44	+.09	30.12	30.67	20	29.57	10	1.10	38.6	+ 1.1	71.6	1	44.5	18.5	20	33.7	53.1	18.8	23	3.5	6	78.5	32.0	3.06	0.00	8,573	ne.	36	sw.	16	12	13	9	8
Lansing	883	29.17	.....	30.15	30.67	20	29.62	10	1.05	36.2	......	71.5	1	45.3	15.0	22	30.9	56.5	24.2	4	3.8	9	90.2	33.4	3.01	....	5,239	nw.	24	sw.	12	14	13	10	7
Manistee	615	29.44	.....	30.13	30.67	20	29.61	10	1.06	37.7	......	69.0	1	43.2	13.8	18	32.3	55.2	21.4	18	3.6	14	76.6	30.8	2.90	....	6,497	nw.	36	w.	16	11	18	11	1
Marquette	672	29.39	+.13	30.14	30.72	20	29.61	1	1.11	33.2	+ 4.0	58.6	1	41.1	10.5	17	28.9	48.1	25.3	18	4.3	29	80.0	27.6	2.07	− 0.49	6,147	nw.	35	sw.	13	12	19	7	4
Port Huron	639	29.44	+.10	30.15	30.65	20	29.60	10	1.05	38.4	+ 4.8	67.0	1	47.2	20.0	21	34.3	47.0	22.6	4	3.2	9	78.0	31.7	2.63	+ 0.01	8,705	nw.	37	n.	26	11	16	6	8
Chicago	715	29.36	+.08	30.14	30.62	20	29.63	10	0.99	40.9	+ 2.6	75.2	1	47.1	20.0	17	36.2	55.2	23.2	3	3.0	20	77.6	34.0	2.89	+ 0.14	7,404	sw.	38	sw.	5	11	16	6	8
Milwaukee	697	29.36	+.08	30.13	30.68	20	29.56	10	1.12	38.8	+ 3.6	70.5	1	45.5	14.0	17	33.7	56.5	21.1	1	1.9	26	77.4	31.8	1.46	− 0.54	6,555	nw.	36	sw.	2	8	14	6	10
Green Bay	616	29.47	.....	30.16	30.75	20	29.70	10	1.05	35.1	......	64.3	1	42.3	9.0	17	30.2	55.3	21.4	18	3.4	5	83.8	30.4	2.12	....	5,282	s.	32	n.	9	6	12	15	3
Duluth	672	29.39	+.11	30.14	30.69	20	29.70	1	0.99	33.4	+ 5.2	57.6	13	39.5	4.5	17	29.0	53.1	24.6	13	4.0	27	81.6	28.2	0.87	− 0.93	4,605	nw.	28	ne.	1	7	14	9	7
Sault de St. Marie	642	29.40	.....	30.12	30.73	20	29.62	2	1.11	30.2	......	56.0	2	36.4	0.6	20	25.5	55.4	22.8	19	2.2	10	84.5	25.9	3.60	....	4,510	nw.	28	w.	16	13	20	8	2
Extreme northwest.										24.4	+ 3.2														0.22	− 0.40									
Moorhead	926	29.10	+.07	30.15	30.70	19	29.71	13	0.99	25.7	+ 5.2	65.0	2	39.2	− 3.0	17	19.1	68.0	36.0	17	3.2	14	83.4	20.8	0.08	− 1.07	5,791	n.	33	s.	13	3	8	4	18
Saint Vincent	804	29.21	+.04	30.12	30.73	19	29.60	13	1.13	23.6	+ 5.0	50.0	13	33.2	− 7.0	17	16.9	57.0	40.0	17	4.1	29	84.0	19.2	0.30	− 0.21	5,623	s.	30	s.	17	6	13	8	9
Bismarck	1,681	28.28	+.07	30.15	30.67	19	29.62	13	1.05	25.6	+ 2.4	59.0	12	41.2	0.0	30	17.7	59.0	38.5	30	3.0	14	79.3	19.3	0.38	− 0.32	4,879	e.	48	nw.	13	7	7	5	18

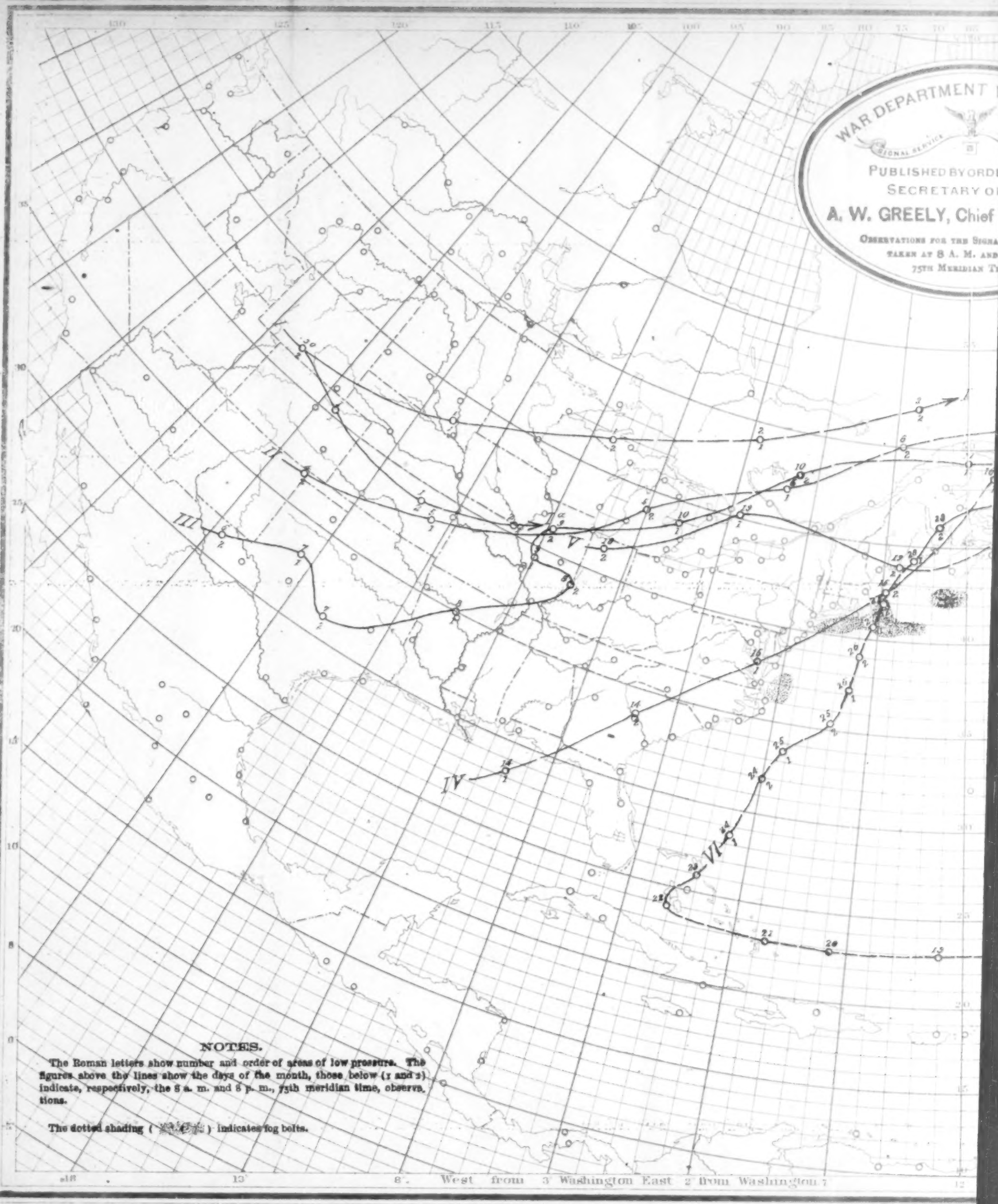
Table of miscellaneous meteorological data for November, 1888—Signal Service observations—Continued.

Stations and districts.	Elevation above sea-level, feet.	Atmospheric pressure: Mean actual barometer.	Departure from normal.	Mean reduced barometer.	Extremes: Highest barometer.	Date.	Lowest barometer.	Date.	Monthly range of barometer.	Temperature: Monthly mean (8 a.m. and 8 p.m.)	Departure from normal.*	Extremes: Max.	Date.	Mean max.	Min.	Date.	Mean min.	Monthly range.	Daily ranges: Greatest.	Date.	Least.	Date.	Mean relative humidity, per cent.	Mean temperature of dew-point, degrees Fahrenheit.	Precipitation, in inches.	Departure from normal precipitation, in inches.	Winds: Total movement, miles.	Prevailing direction.	Maximum velocity: Miles p. h.	Direction.	Date.	No. of rainy days.	No. of cloudy days.	No. of fair days.	No. of clear days.
Ex. northwest—Con.																																			
Fort Buford	1,900	28.00	+.03	30.10	30.59	19	29.53	13	1.06	24.6	+ 1.6	53.5	12	39.7	1.2	17	15.5	52.3	36.7	23	6.4	7	79.8	18.7	0.10	− 0.28	4,233	w.	36	nw.	13	4	7	10	13
Fort Totten	1,487	28.46	+.06	30.14	30.69	19	29.60	13	1.09	22.6	+ 1.8	58.8	12	35.1	− 3.0	17	16.5	61.8	40.0	17	5.4	7	85.6	18.5	0.27	− 0.28	7,882	nw.	46	nw.	13	3	9	3	18
Fort Yates	...	...	...	...	...	...	...	...	...	29.4	...	59.1	3	44.2	3.0	30	14.7	56.0	38.5	9	8.0	27	...	...	0.17	− 0.25	...	nw.	...	...	...	5	...	...	...
Upper Miss. Valley.										**33.6**	**+ 1.8**														**2.72**	**+ 0.41**									
Saint Paul	831	29.21	+.10	30.13	30.64	20	29.68	1	0.96	32.7	+ 5.0	65.7	1	44.4	6.0	17	27.7	59.7	29.7	13	3.3	5	82.2	27.4	0.34	− 0.99	4,564	se.	24	s.	13	4	5	16	9
La Crosse	744	29.36	+.12	30.18	30.71	20	29.67	1	1.04	35.5	+ 3.2	68.9	1	45.3	8.9	17	29.2	60.0	27.7	3	3.4	29	75.4	28.0	0.28	− 1.51	5,318	s.	30	nw.	10	4	10	7	13
Davenport	615	29.48	+.07	30.16	30.65	20	29.64	9	1.01	38.1	+ 2.1	78.0	1	46.8	19.4	17	33.4	58.6	29.0	3	3.0	9	81.0	32.4	3.54	+ 1.62	5,012	nw.	39	s.	1	7	10	8	12
Des Moines	866	29.22	+.07	30.17	30.65	20	29.65	1	1.00	35.8	+ 1.8	75.0	1	47.9	15.0	16	29.8	60.0	33.9	3	4.0	29	74.8	28.0	2.09	− 0.03	4,117	n.	30	s.	1	5	10	13	17
Dubuque	665	29.43	+.09	30.17	30.69	20	29.73	10	0.96	37.0	+ 3.0	72.0	1	46.1	16.5	17	31.9	55.5	29.2	3	2.3	9	81.9	31.8	2.75	+ 0.67	2,974	nw.	25	sw.	1	6	14	4	12
Keokuk	618	29.48	+.07	30.15	30.62	20	29.59	9	1.03	39.2	+ 1.8	79.1	1	49.8	22.0	16	33.8	57.1	25.5	24	3.6	8	76.0	31.8	2.83	+ 0.92	5,246	nw.	36	s.	1	10	11	6	13
Cairo	359	29.76	+.02	30.15	30.48	20	29.62	8	0.86	45.5	− 0.3	78.4	5	53.1	28.2	27	40.3	50.2	24.3	12	2.0	30	77.9	38.5	4.85	+ 0.84	6,034	n.	34	nw.	6	11	16	6	8
Springfield, Ill.	644	29.47	+.06	30.17	30.60	20	29.64	9	0.96	40.0	0.0	76.7	1	49.5	23.0	22	34.4	53.7	30.7	3	5.1	29	81.2	34.4	3.41	+ 0.57	6,019	s.	27	ne.	9	10	14	8	8
Saint Louis	571	29.53	+.03	30.16	30.57	20	29.62	9	0.95	43.6	− 0.2	79.0	1	51.7	28.5	16	38.0	50.5	25.7	12	4.7	29	77.4	36.4	4.40	+ 1.62	6,465	n.	38	nw.	10	9	14	8	8
Missouri Valley.										**35.3**	**+ 0.6**														**0.99**	**0.00**									
Lamar	1,028	29.08	...	30.20	30.58	20	29.72	9	0.86	41.2	− 3.0	81.0	5	51.3	25.8	11	34.7	55.2	33.5	3	2.5	30	77.2	33.7	2.50	+ 1.28	6,288	n.	30	n.	9	10	16	1	13
Springfield, Mo.	1,356	28.68	+.03	30.15	30.51	20	29.64	9	0.87	40.8	...	79.0	5	50.4	26.7	27	36.0	52.3	26.7	4	2.0	8	82.0	35.1	3.78	...	6,331	ne.	36	n.	8	10	17	6	7
Leavenworth	842	29.28	+.08	30.19	30.63	20	29.73	5	0.90	38.2	− 1.3	78.8	1	48.7	22.3	22	32.7	56.5	31.3	3	1.3	29	81.0	32.4	3.50	+ 1.21	4,008	s.	30	s.	1	6	12	4	14
Topeka	...	...	...	...	...	...	...	...	...	35.6	...	81.4	1	48.6	12.0	11	29.0	69.4	35.0	3	3.2	29	85.9	31.4	2.91	...	...	...	...	...	...	5	10	9	11
Omaha	1,113	28.98	+.07	30.19	30.68	20	29.74	1	0.94	36.7	+ 1.7	77.6	1	48.8	17.2	16	30.6	60.4	30.4	3	2.3	29	70.3	27.0	0.12	− 1.19	6,220	s.	34	n.	9	2	10	7	13
Crete	...	...	...	...	...	...	...	...	...	34.9	...	74.8	1	48.5	12.8	30	26.9	62.0	35.5	25	3.8	28	73.0	25.8	0.17	...	...	...	...	...	...	3	9	3	18
Valentine	2,613	27.38	...	...	...	...	...	...	...	33.7	...	80.0	3	56.5	9.0	30	24.7	71.0	47.8	21	9.0	28	69.6	23.8	0.19	− 0.14	6,333	sw.	36	w.	3	2	6	5	19
Fort Sully	1,600	28.38	+.04	30.13	30.63	19	29.68	13	0.95	29.2	...	65.9	12	46.5	1.7	30	20.5	64.2	44.7	12	6.7	14	66.8	18.4	0.11	− 0.42	4,097	nw.	36	nw.	13	3	8	3	19
Huron	1,307	28.71	+.06	30.16	30.67	19	29.68	1	0.99	28.3	+ 2.6	66.2	13	45.1	3.3	30	20.0	62.9	43.0	2	7.1	14	67.8	18.6	0.34	− 0.26	5,309	se.	30	w.	2	4	6	3	21
Yankton	1,234	28.80	+.06	30.15	30.66	19	29.62	1	1.04	32.1	+ 3.2	78.8	3	48.0	9.0	17	24.3	69.8	48.0	3	4.1	28	76.1	24.8	0.19	− 0.47	5,364	nw.	26	nw.	14	8	7	9	14
Kansas City	947	29.15	...	30.19	30.62	20	29.72	5	0.90	40.4	...	77.6	1	49.0	25.5	16	35.0	52.1	26.3	3	1.4	29	74.8	32.2	2.08	...	5,253	se.	34	s.	1	7	12	5	13
Northern slope.										**27.8**	**− 1.0**														**0.28**	**− 0.32**									
Fort Assinaboine	2,720	27.18	+.01	30.08	30.43	14	29.48	12	0.95	27.6	+ 0.2	61.4	12	41.5	− 5.9	15	17.0	67.3	34.5	19	6.4	13	63.8	15.8	0.06	− 0.78	6,793	sw.	44	w.	3	2	6	5	19
Fort Custer	3,040	26.89	+.03	30.16	30.54	19	29.59	13	0.95	24.2	− 6.5	63.7	12	37.9	−11.5	17	15.1	75.2	40.2	12	4.6	14	79.7	17.2	0.40	− 0.01	2,938	se.	35	n.	13	3	11	6	13
Fort Maginnis	4,340	25.56	+.03	30.06	30.36	14	29.59	12	0.77	31.6	+ 0.6	58.8	24	44.7	8.0	14	24.5	50.8	34.6	19	7.8	14	63.2	20.2	0.03	− 0.90	6,714	nw.	45	sw.	13	1	1	8	21
Helena	4,069	25.89	+.03	30.18	30.53	19	29.61	12	0.92	24.2	− 6.3	57.0	12	32.6	− 4.0	17	16.8	61.0	31.0	12	6.5	14	63.6	13.0	0.32	− 0.21	2,785	sw.	30	sw.	8	6	6	4	20
Poplar River	2,030	27.91	+.04	30.10	30.57	19	29.59	13	0.98	23.2	+ 1.0	61.8	12	40.6	− 4.0	17	13.4	65.8	41.0	12	7.0	14	80.9	17.9	0.11	− 0.29	2,727	w.	33	nw.	13	2	3	8	19
Cheyenne	6,105	24.02	+.03	30.16	30.52	19	29.72	1	0.80	29.8	− 0.9	62.0	3	43.7	7.0	8	22.5	55.0	34.6	24	1.2	27	62.9	16.9	0.59	+ 0.28	6,379	w.	36	nw.	2	6	11	7	12
Fort Laramie	...	...	...	...	...	...	...	...	...	33.0	...	69.4	3	46.2	− 5.6	16	19.8	75.0	40.7	12	8.0	28	...	...	0.81	...	...	w.	...	...	...	6	...	...	...
North Platte	2,841	27.15	+.04	30.18	30.59	19	29.73	1	0.86	31.6	+ 0.4	74.9	3	49.2	9.0	16	23.6	65.9	42.0	12	6.0	7	68.6	21.6	0.08	− 0.34	5,705	se.	28	se.	17	1	7	13	10
Rapid City	3,280	26.65	...	30.14	30.54	19	29.74	13	0.80	31.0	...	67.8	13	47.8	10.4	19	23.8	57.4	41.8	13	7.8	14	72.8	22.7	0.47	...	4,798	nw.	40	n.	13	4	2	8	20
Fort McKinney	...	24.98	...	30.13	30.42	16	29.75	13	0.67	32.3	...	60.0	13	43.8	2.0	16	25.2	58.0	35.0	13	4.0	4	63.0	20.4	0.23	...	5,708	w.	48	nw.	26	5	7	7	16
Middle slope.										**37.4**	**− 0.2**														**0.41**	**− 0.26**									
Colorado Springs	...	...	...	...	...	...	...	...	...	33.1	...	68.5	3	49.0	11.6	8	23.9	56.9	39.2	9	4.7	27	67.0	22.0	0.22	...	...	...	...	...	...	6	4	8	18
Denver	5,281	24.78	+.03	30.14	30.48	8	29.62	1	0.86	34.4	− 1.0	70.2	3	49.1	11.5	8	25.0	58.7	40.3	11	2.6	27	61.8	20.2	0.33	− 0.40	3,454	s.	32	n.	7	6	6	15	9
Pueblo	4,724	25.31	...	30.19	30.48	20	29.76	4	0.72	34.7	...	72.0	3	51.4	12.9	9	24.4	59.1	45.7	13	4.2	27	55.3	16.9	0.59	...	3,384	nw.	40	n.	1	3	7	10	13
Concordia	1,384	28.66	...	30.16	30.61	20	29.70	1	0.91	36.2	− 0.8	75.0	3	49.4	16.2	30	30.9	58.0	34.8	25	3.2	8	81.9	30.6	0.58	− 0.42	4,366	s.	32	s.	1	4	8	8	14
Dodge City	2,523	27.49	+.05	30.19	30.59	20	29.71	1	0.88	38.1	+ 1.2	83.8	1	50.8	18.5	30	31.5	65.3	36.6	3	2.3	17	68.4	27.8	0.06	− 0.52	7,174	s.	45	s.	1	3	8	11	11
Fort Reno	...	...	...	...	...	...	...	...	...	46.2	...	85.0	4	57.1	21.0	30	35.2	64.0	...	...	...	...	...	...	0.42	− 0.03	...	nw.	...	...	...	10	...	...	...
Fort Supply	...	...	...	...	...	...	...	...	...	47.9	...	78.8	4	60.6	19.2	29	35.2	59.6	34.5	19	7.6	29	...	...	0.30	− 0.46	...	s.	...	...	...	5	...	...	...
Fort Elliott	2,650	27.35	+.06	30.12	30.50	20	29.68	4	0.82	40.7	− 0.2	84.2	4	52.5	22.2	21	35.2	62.0	30.9	4	3.0	26	76.0	32.5	0.79	+ 0.25	7,851	nw.	52	nw.	8	4	13	6	11
Wichita	1,354	28.68	...	30.16	30.55	20	29.67	5	0.88	39.7	...	78.0	1	49.6	22.6	10	33.5	55.4	28.8	3	4.7	29	77.4	32.3	1.29	...	6,238	n.	44	n.	8	5	12	11	7
Southern slope.										**46.2**	**− 2.3**														**2.35**	**+ 1.88**									
Fort Sill	1,200	28.89	+.03	30.17	30.53	24	29.75	7	0.78	44.0	− 0.2	84.2	5	56.4	22.0	22	37.3	62.2	40.0	4	4.0	26	81.1	38.2	1.62	− 0.01	6,322	n.	40	n.	8	10	12	6	12
Abilene	1,748	28.30	+.02	30.14	30.51	20	29.61	7	0.90	47.6	− 5.0	85.3	4	56.4	27.8	23	41.7	57.5	28.5	15	4.7	26	87.4	43.6	4.80	+ 4.22	5,438	n.	38	n.	8	7	20	5	5
Fort Davis	4,928	25.21	−.04	30.09	30.39	20	29.68	7	0.71	47.0	− 1.6	80.5	4	59.1	24.0	9	39.8	56.5	34.5	17	3.0	25	67.4	34.5	1.46	+ 0.90	3,867	sw.	33	ne.	8	11	13	8	9
Fort Stanton	6,154	23.97	...	29.98	30.25	20	29.60	7	0.65	37.6	...	69.5	4	51.0	18.0	8	28.9	51.5	41.3	3	3.8	25	59.5	22.8	1.53	+ 1.25	4,519	w.	40	w.	1	7	12	11	7
Southern plateau.										**47.8**	**+ 0.6**														**2.14**	**+ 1.49**									
El Paso	3,796	26.22	−.08	30.02	30.30	20	29.76	7	0.54	51.0	+ 2.0	79.0	4	64.1	25.0	10	42.0	54.0	38.0	10	3.5	24	58.1	34.4	1.32	+ 0.83	5,673	e.	36	w.	7	7	10	5	15
Lava	...	...	...	...	...	...	...	...	...	42.9	...	71.3	2	56.8	17.5	7	29.0	53.8	40.7	11	7.6	28	...	...	4.85	+ 4.77	...	sw.	...	...	...	7	...	...	...
Santa Fé	7,026	23.26	−.04	30.10	30.40	20	29.74	7	0.66	35.4	+ 0.6	64.1	4	46.4	12.0	9	28.7	52.1	31.1	9	5.5	26	62.4	22.0	1.30	+ 0.44	3,385	ne.	26	n.	13	8	8	9	13
Fort Apache	...	...	...	...	...	...	...	...	...	47.4	...	71.0	2	60.8	19.0	9	34.0	52.0	44.6	10	13.7	25	...	...	2.63	+ 1.54	...	sw.	...	...	...	10	...	...	...
Fort Bowie	...	...	...	...	...	...	...	...	...	50.0	...	70.6	4	58.1	31.4	10	42.0	39.2	29.1	10	5.3	27	...	...	1.95	+ 1.14	...	sw.	...	...	...	10	...	...	...
Fort Grant	4,862	25.20	−.06	30.05	30.27	9	29.79	23	0.48	49.1	− 1.2	73.3	2	59.2	30.5	9	42.5	42.8	28.8	14	5.8	17	57.3	32.0	3.67	+ 3.13	5,057	ne.	36	e.	25	9	9	6	15
Fort McDowell	...	...	...	...	...	...	...	...	...	58.2	...	78.0	2	69.5	36.0	9	46.8	42.0	34.2	14	5.8	20	...	...	1.49	+ 0.37	...	nw.	...	...	...	10	...	...	...
Fort Thomas	2,710	...	...	...	...	...	...	...	...	53.6	...	78.0	1	65.6	31.0	10	41.6	47.0	38.0	10	8.0	26	...	...	1.72	+ 1.38	...	nw.	...	...	...	10	...	...	...
Fort Verde	...	...	...	...	...	...	...	...	...	50.5	...	79.0	2	63.4	25.7	9	38.5	53.3	38.7	2	9.0	28	...	...	2.86	+ 2.11	...	se.	...	...	...	14	...	...	...
Phœnix	...	...	...	...	...	...	...	...	...	69.3	...	91.0	3	80.2	48.0	24	58.4	43.0	...	...	...	...	...	...	1.10	+ 0.64	...	...	...	...	...	4	...	...	...
Prescott	5,389	24.71	−.04	30.04	30.28	2	29.78	23	0.50	41.7	+ 1.8	64.5	2	53.4	24.0	9	34.3	40.5	33.8	9	3.3	4	74.8	33.2	3.18	+ 2.33	5,535	sw	52	sw.	4	13	13	9	8
San Carlos	...	...	...	...	...	...	...	...	...	51.8	...	78.3	1	63.2	32.7	7	40.4	45.6	39.8	7	2.8	5	...	...	1.76	+ 1.20	...	sw.	...	...	...	10	...	...	...
Wilcox	...	...	...	...	...	...	...	...	...	44.8	...	80.0	2	65.8	18.3	9	23.9	61.7	47.5	14	10.9	25	...	...	1.86	+ 0.74	...	ne.	...	...	...	8	...	...	...
Yuma	141	29.81	−.06	29.95	30.13	8	29.68	23	0.45	60.0	+ 0.9	82.5	2	73.8	38.1	30	50.0	44.4	35.3	11	8.1	16	67.7	48.2	0.68	+ 0.32	3,826	n.	30	n.	7	5	6	6	18
Keeler	3,622	26.32	...	29.99	30.20	19	29.65	23	0.55	49.4	− 0.2	70.0	2	58.1	32.4	30	41.6	37.6	25.7	2	5.8	17	52.0	30.4	1.68	+ 1.43	3,752	s.	34	nw.	27	7	5	10	15
Middle plateau.										**38.1**	**+ 2.6**														**1.42**	**+ 0.40**									
Fort Bidwell†	4,640	25.46	...	30.18	30.43	8	29.96	12	0.47	38.2	...	59.0	2	53.9	16.0	5	25.4	43.0	43.0	5	15.2	3	70.8	29.3	0.63	...	1,897	w.	28	s.	13	2	7	4	4
Winnemucca	4,340	25.68	−.01	30.13	30.47	8	29.82	16	0.65	38.6	+ 2.2	63.7	2	51.6	4.0	29	26.8	59.7	39.7	12	6.5	26	57.2	22.6	0.52	− 0.31	5,937	ne.	32	sw.	13	5	11	5	14
Salt Lake City	4,348	25.67	−.05	30.10	30.43	8	29.83	26	0.60	40.7	+ 4.6	63.1	3	49.3	25.7	9	33.9	37.4	25.2	2	6.0	29	65.6	29.3	2.00	+ 0.48	2,648	nw.	26	s.	3	8	12	6	12
Montrose	5,795	24.31	...	30.09	30.41	9	29.69	4	0.72	34.9	+ 0.9	57.2	2	47.1	16.9	9	26.7	40.3	31.8	2	9.6	28	73.2	26.8	1.74	+ 1.03	2,677	se.	23	nw.	7	9	16	4	10
Carson City	...	...	...	...	...	...	...	...	...	38.6	...	68.1	2	51.4	15.7	29	28.6	52.4	43.1	2	6.3	26	72.5	29.8	1.75	...	...	...	...	...	...	8	11	6	13
Brock's	...	...	...	...	...	...	...	...	...	36.8	...	57.0	1	48.0	14.2	9	25.6	42.8	32.8	12	8.0	28	...	...	0.69	...	...	sw.	...	...	...	7	...	...	...
Fort Du Chesne	...	23.09	...	30.12	30.44	9	29.78	4	0.66	29.6	...	57.5	1	47.2	9.7	13	22.6	47.8	38.4	13	5.0	28	67.6	19.7	0.26	...	2,022	se.	27	w.	1	3	11	5	14
Northern plateau.										**38.8**	**− 0.1**														**1.64**	**− 0.17**									
Boise City	2,750	27.27	−.02	30.17	30.47	8	29.85	12	0.62	38.0	+ 0.8	64.8	12	48.5	18.3	28	29.2	46.5	40.8	12	6.1	3	73.5	29.2	1.00	+ 0.24	1,797	w.	18	e.	6	9	11	11	8
Ashland	...	...	...	...	...	...	...	...	...	46.0	...	72.0	8	56.0	24.0	28	36.0	48.0	40.0	8	7.0	14	...	...	2.44	− 0.09	...	w.	...	...	...	11	...	...	...
Fort Klamath	...	...	...	...	...	...	...	...	...	35.6	...	56.1	11	45.7	12.0	27	25.6	44.1	37.8	11	7.8	21	...	...	2.22	− 0.26	...	s.	...	...	...	14	...	...	...
Linkville	...	...	...	...	...	...	...	...	...	37.7	...	54.5	11	47.3	18.0	5	28.2	36.5	33.5	10	7.4	16	...	...	1.44	+ 0.12	...	n.	...	...	...	10	...	...	...
Spokane Falls	1,909	28.08	+.03	30.15	30.49	28	29.57	12	0.92	35.0	− 1.0	54.5	12	42.5	15.2	17	29.6	39.3	22.8	8	4.9	30	83.2	30.0	1.08	− 0.84	2,358	sw.	20	sw.	1	11	19	6	5
Walla Walla	[illegible]	29.05	+.03	30.17	30.48	27	29.68	12	0.80	38.4	...	63.1	12	45.0	18.0	15	33.4	45.1	24.0	11	4.4	14	81.1	32.6	0.87	...	3,166	sw.	28	w.	6	6	15	8	7
N. Pac. coast region.										**44.3**	**− 0.3**														**7.33**	**− 0.21**									
Fort Canby	179	29.83	−.01	30.03	30.33	7	29.71	12	0.62	47.4	− 1.4	55.0	1	50.0	35.7	14	43.3	19.3	12.6	15	3.0	11	84.4	42.2	8.43	+ 0.86	10,186	se.	54	s.	11	19	20	5	5
Neah Bay	...	...	...	...	...	...	...	...	...	46.0	...	58.5	27	53.0	28.5	26	39.0	30.0	...	...	...	...	...	...	11.20	− 2.30	...	se.	...	...	...	22	...	...	...
Olympia	36	30.02	−.01	30.06	30.37	7	29.70	12	0.67	43.7	− 0.4	55.0	20	49.3	24.0	17	38.0	31.0	23.0	17	5.0	23	87.3	40.0	6.05	− 0.80	2,888	s.	20	s.	1	18	21	5	4
Port Angeles	14	30.01	−.01	30.02	30.40	14	29.66	12	0.74	40.2	− 1.1	54.9	1	47.2	24.0	15	34.6	30.9	20.0	16	4.8	28	89.6	37.3	3.77	+ 0.93	2,764	s.	22	ne.	14	20	19	7	4
Pysht	...	...	...	...	...	...	...	...	...	42.5	...	53.0	1	46.8	28.0	18	38.2	25.0	15.0	18	2.0	10	...	...	7.31	0.00	...	se.	...	...	...	21	...	...	...
Tatoosh Island	86	29.91	.00	30.00	30.37	14	29.64	12	0.73	47.0	+ 0.3	56.2	19	50.9	35.8	14	43.7	20.4	12.2	19	3.2	7	89.0	43.7	10.76	− 1.73	12,393	e.	57	e.	16	24	22	4	4
Astoria	38	...	...	...	...	...	...	...	...	46.6	...	58.0	1	51.3	35.0	15	42.0	23.0	...	...	...	...	...	...	10.45	+ 3.44	...	sw.	...	...	...	...	...	...	...
Portland	80	30.00	−.01	30.09	30.40	27	29.74	12	0.66	44.0	− 1.0	58.3	2	49.2	31.0	24	38.7	27.3	16.5	28	4.7	30	84.5	39.2	4.47	− 2.12	3,800	nw.	30	sw.	6	17	21	5	4
Roseburgh	523	29.52	−.05	30.09	30.40	27	29.73	16	0.67	47.0	+ 2.0	62.0	7	53.8	30.6	28	40.3	31.4	21.0	1	6.8	20	89.4	43.7	3.54	− 0.19	1,627	nw.	19	s.	30	18	16	12	2
Mid. Pac. coast reg.										**54.5**	**+ 1.7**														**4.20**	**+ 1.48**									
Eureka	64	29.98	...	30.04	30.30	5	29.63	16	0.67	50.2	...	70.2	17	58.1	34.6	27	44.4	35.6	24.5	8	2.8	3	86.8	46.2	3.41	...	2,809	n.	34	n.	7	14	15	7	8
Red Bluff	342	29.68	−.07	30.03	30.20	6	29.73	16	0.47	54.8	+ 2.0	73.0	8	62.2	36.5	29	45.7	36.5	31.6	10	3.7	22	62.6	38.4	4.32	+ 1.00	4,190	n.	26	n.	27	8	11	6	13
Sacramento	64	29.94	−.09	30.01	30.20	6	29.69	16	0.51	53.6	+ 2.0	75.0	2	64.2	32.2	29	43.9	42.8	35.0	8	4.0	30	71.2	42.8	4.28	+ 2.33	3,487	se.	21	nw.	7	7	6	7	17
San Francisco	60	29.95	−.09	30.02	30.21	6	29.68	16	0.53	55.1	+ 1.0	74.3	8	62.7	47.0	29	51.4	27.3	21.0	7	4.0	17	80.1	48.0	3.99	+ 1.11	3,937	w.	26	se.	22	7	10	12	8
S. Pac. coast region.										**56.6**	**+ 1.9**														**2.92**	**+ 1.88**									
Fresno	313	29.68	...	30.03	30.21	30	29.73	23	0.48	53.7	...	78.0	2	64.6	34.8	13	44.0	43.2	39.2	8	2.3	29	78.8	46.3	2.38	...	2,248	nw.	18	s.	16	7	10	6	14
Los Angeles	330	29.63	−.05	29.98	30.14	19	29.71	23	0.43	57.2	+ 1.9	83.8	2	69.7	40.0	8	50.1	43.8	39.0	8	6.3	17	74.1	47.6	4.02	+ 2.63	2,128	ne.	18	ne.	16	8	7	8	15
San Diego	66	29.92	−.06	29.99	30.12	19	29.71	23	0.41	58.8	+ 1.9	75.2	8	66.0	46.5	30	53.8	28.7	23.5	9	5.2	4	85.8	54.2	1.83	+ 1.02	3,216	nw.	23	nw.	23	6	13	5	12

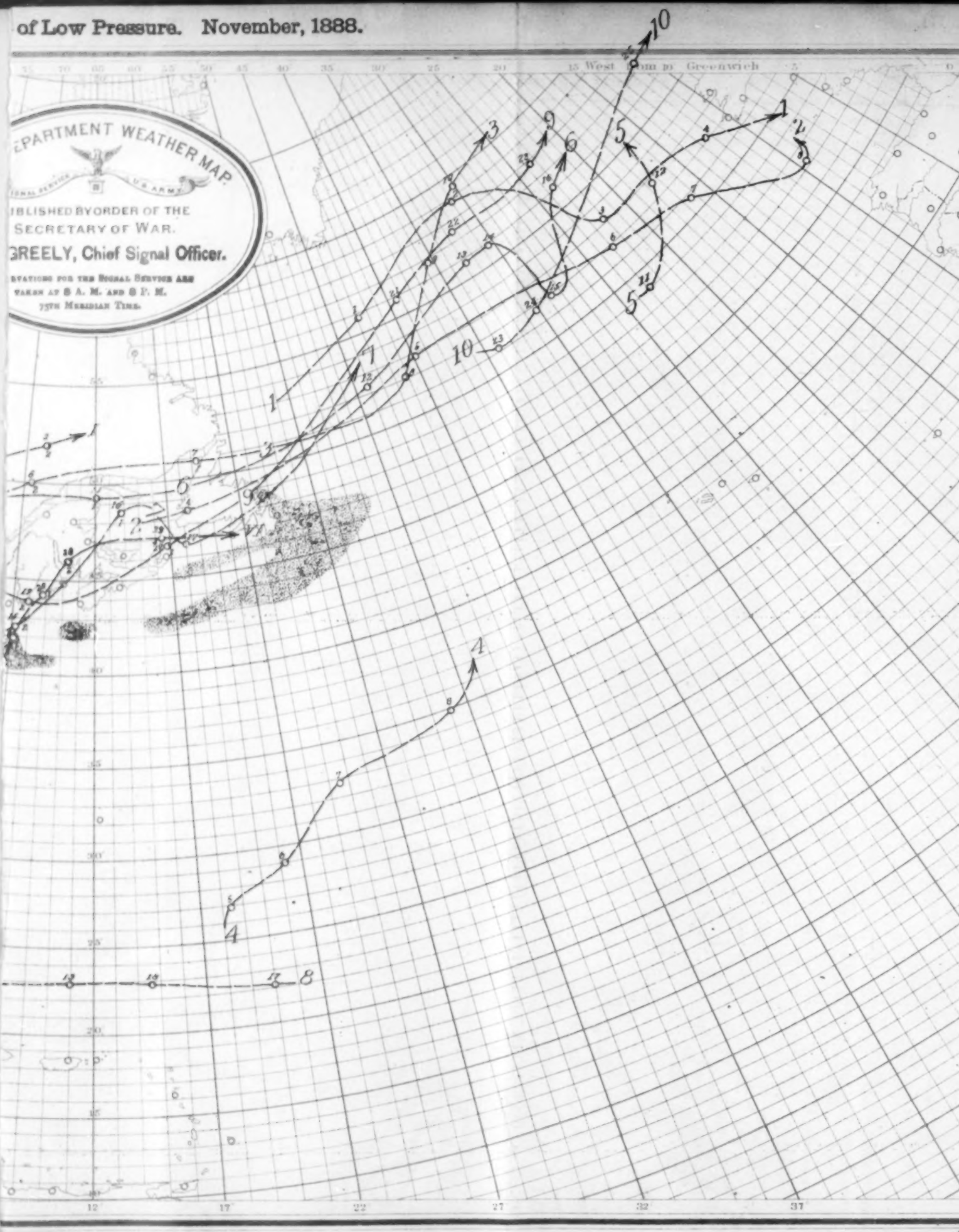
NOTE.—The data at stations having no departures are not used in computing the district averages. * Departure from mean of maximum and minimum values. † For 15 days.

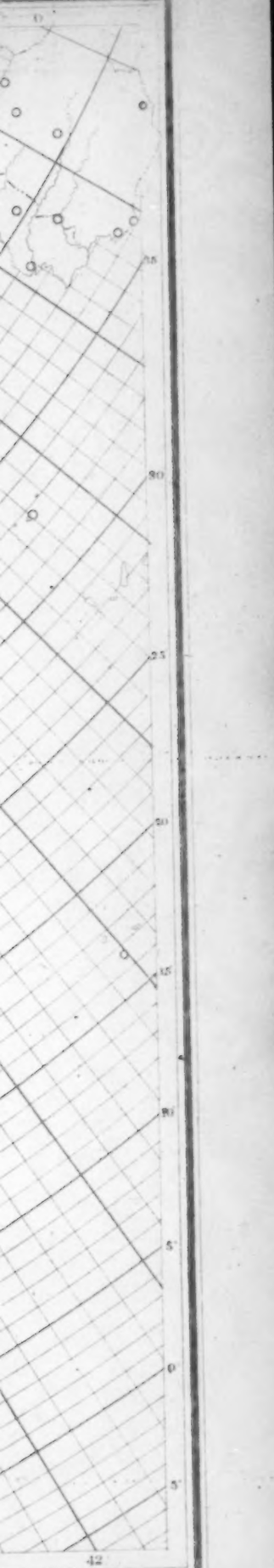
Form 106 C 1884

Chart I. Tracks of Areas of Low Pres


WAR DEPARTMENT
SIGNAL SERVICE
PUBLISHED BY ORDE
SECRETARY OF
A. W. GREELY, Chief
OBSERVATIONS FOR THE SIGNA
TAKEN AT 8 A. M. AND
75TH MERIDIAN T
I
II
III
IV
V
VI
NOTES.
The Roman letters show number and order of areas of low pressure. The figures above the lines show the days of the month, those below (1 and 2) indicate, respectively, the 8 a. m. and 8 p. m., 75th meridian time, observations.
The dotted shading ( ) indicates fog belts.
West from 3 Washington East 2 from Washington 7

of Low Pressure. November, 1888.


EPARTMENT WEATHER MAP.
IBLISHED BY ORDER OF THE
SECRETARY OF WAR.
GREELY, Chief Signal Officer.
STATIONS FOR THE SIGNAL SERVICE ARE
TAKEN AT 8 A. M. AND 8 P. M.
75TH MERIDIAN TIME.
West from Greenwich



Signal Office Lith.

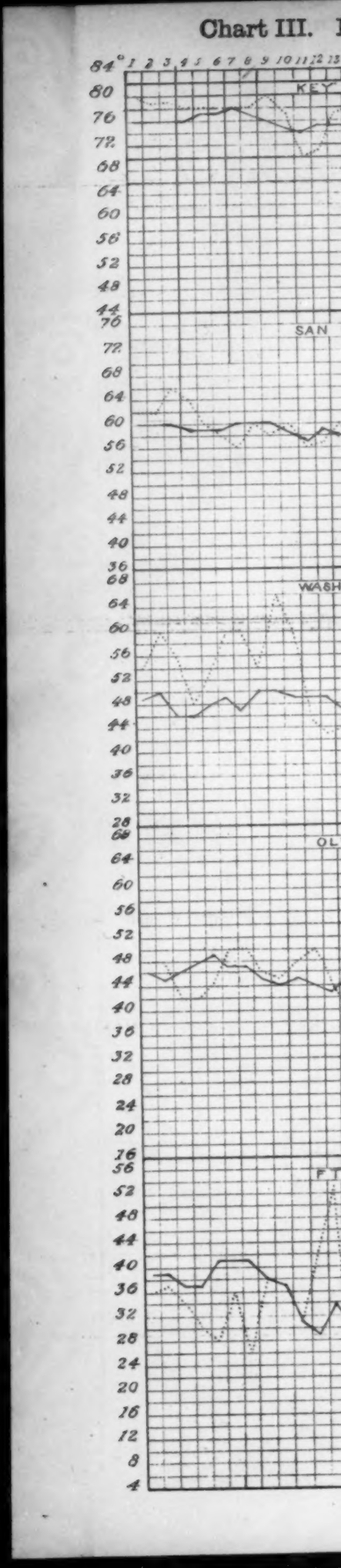
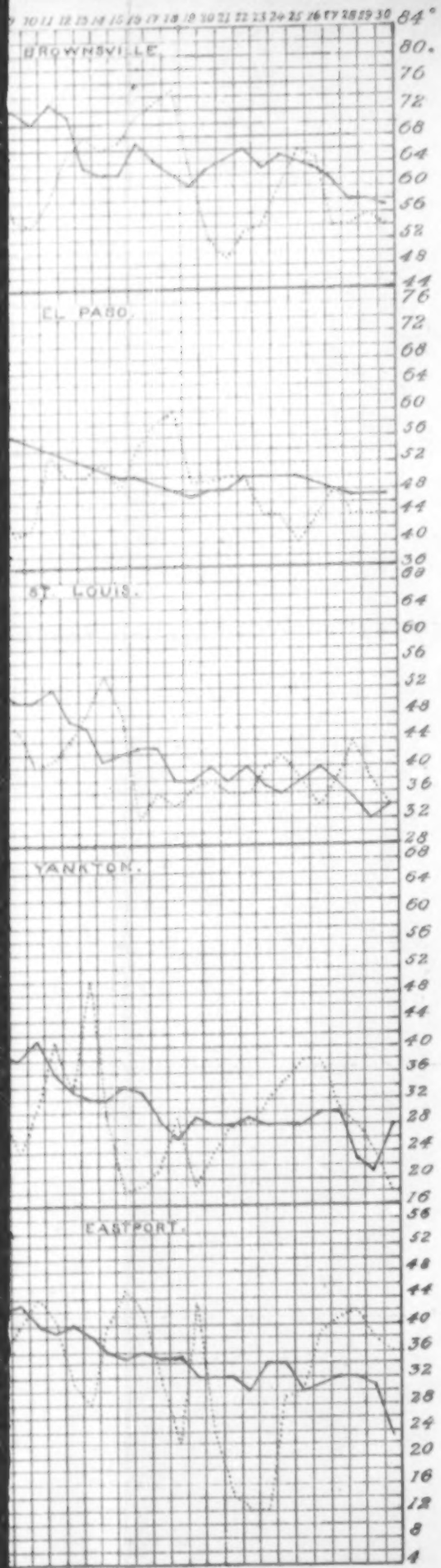


Chart III.
KEY
SAN
WASH
OL
P

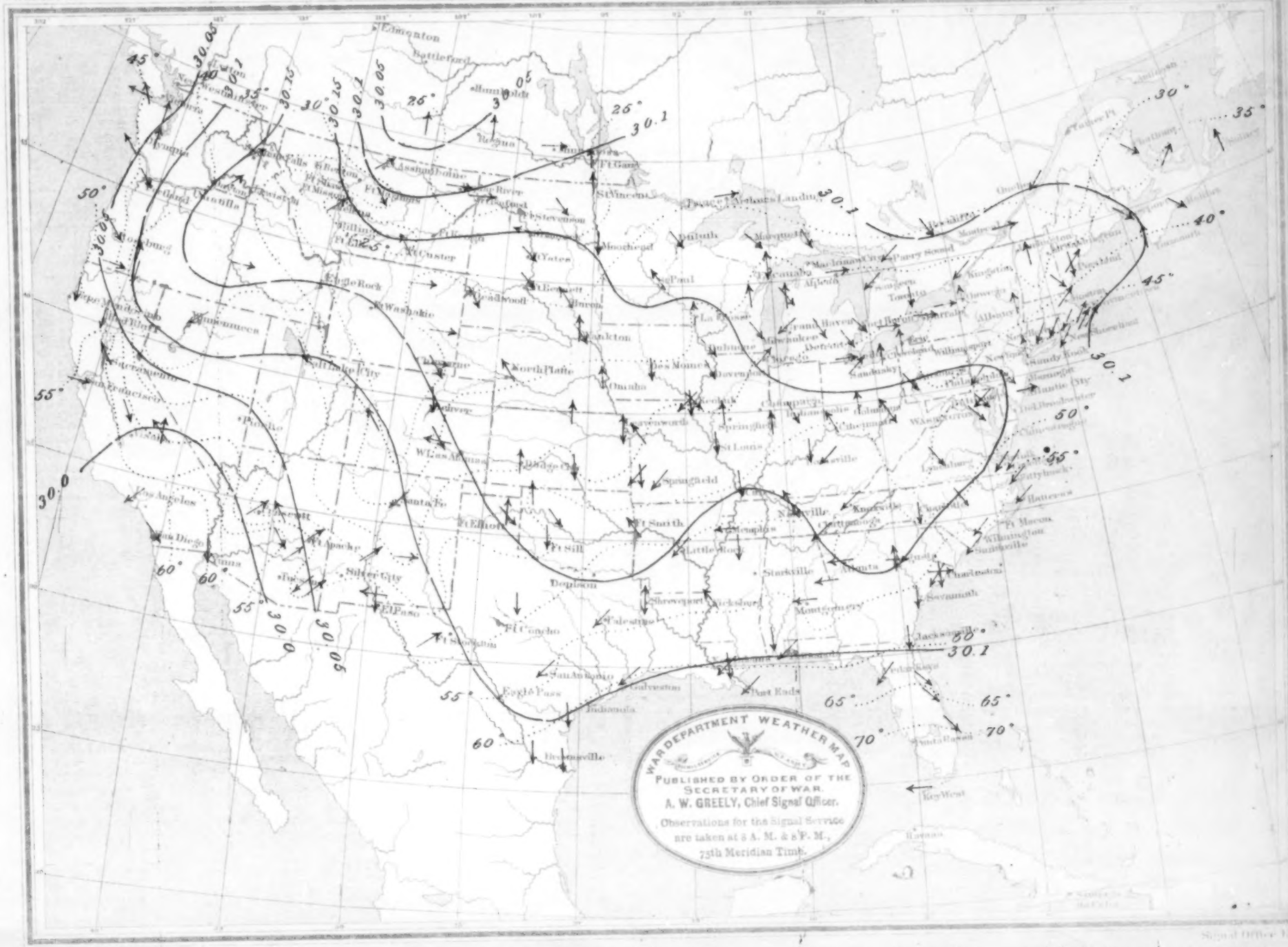
III. Normal temperatures for a number of years (———). Mean temperatures for November, 18

vember, 1888 (·····).



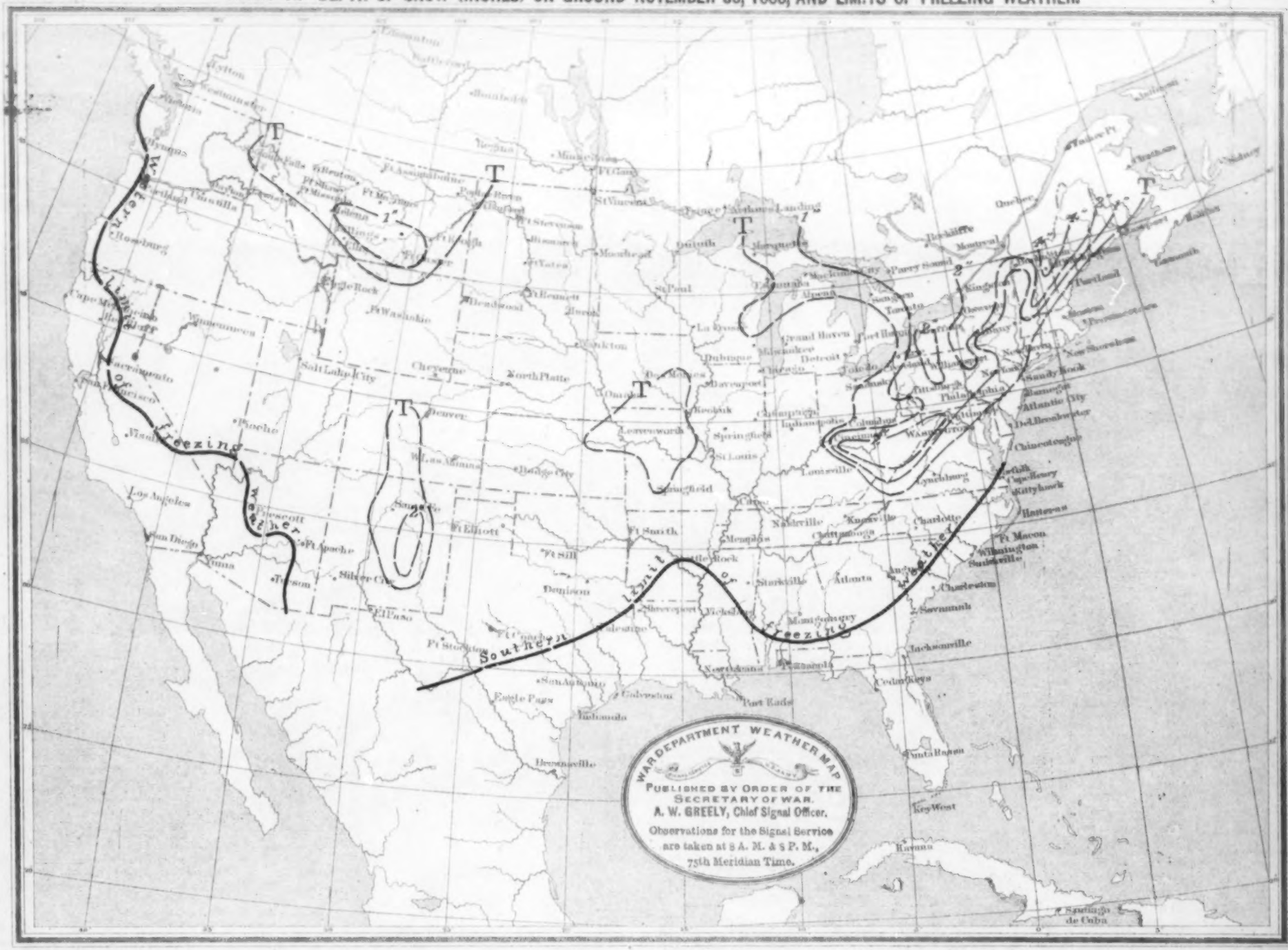
Form 106 F.

Chart II. Isobars, Isotherms, and Winds. November, 1888.


WAR DEPARTMENT WEATHER MAP
PUBLISHED BY ORDER OF THE SECRETARY OF WAR.
A. W. GREELY, Chief Signal Officer.
Observations for the Signal Service are taken at 8 A. M. & 8 P. M., 75th Meridian Time.

Form 106 F

CHART VI. DEPTH OF SNOW (INCHES) ON GROUND NOVEMBER 30, 1888, AND LIMITS OF FREEZING WEATHER.


Western Limit of Freezing Weather
Southern Limit of Freezing Weather
T
1
2
WAR DEPARTMENT WEATHER MAP
PUBLISHED BY ORDER OF THE SECRETARY OF WAR.
A. W. GREELY, Chief Signal Officer.
Observations for the Signal Service are taken at 8 A. M. & 8 P. M., 75th Meridian Time.

Form 106 F.

Chart IV. Precipitation, November, 1888.

Scale of Shades.
0 to 2 inches.
2 „ 4 „
4 „ 6 „
6 „ 8 „
over 8 „
WAR DEPARTMENT WEATHER MAP
PUBLISHED BY ORDER OF THE SECRETARY OF WAR.
A. W. GREELY, Chief Signal Officer.
Observations for the Signal Service are taken at 8 A. M. & 8 P. M., 75th Meridian Time.

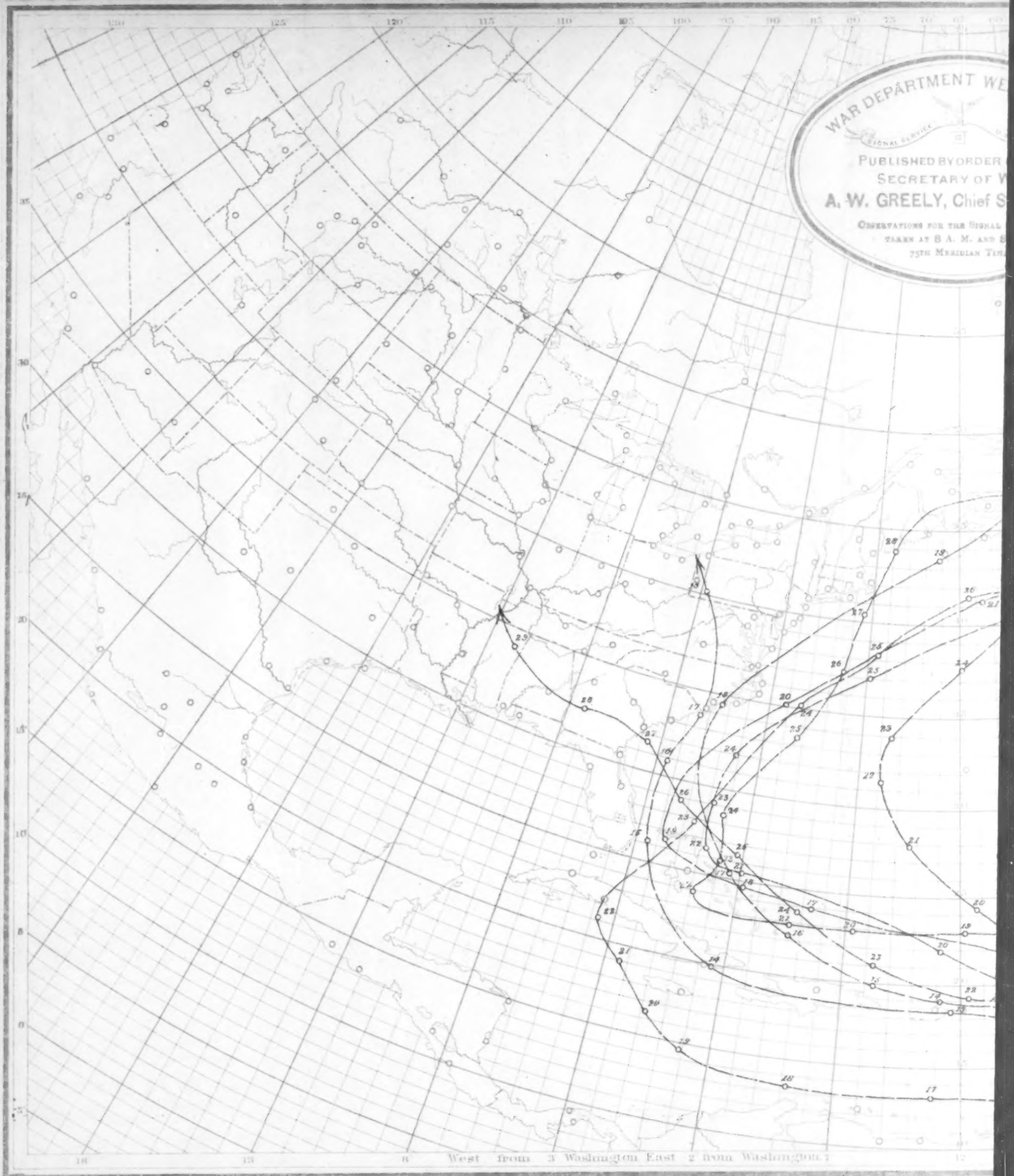
Signal Office Lith.

Chart V. Normal Precipitation for November from 18 years observations 1870 to 1888.

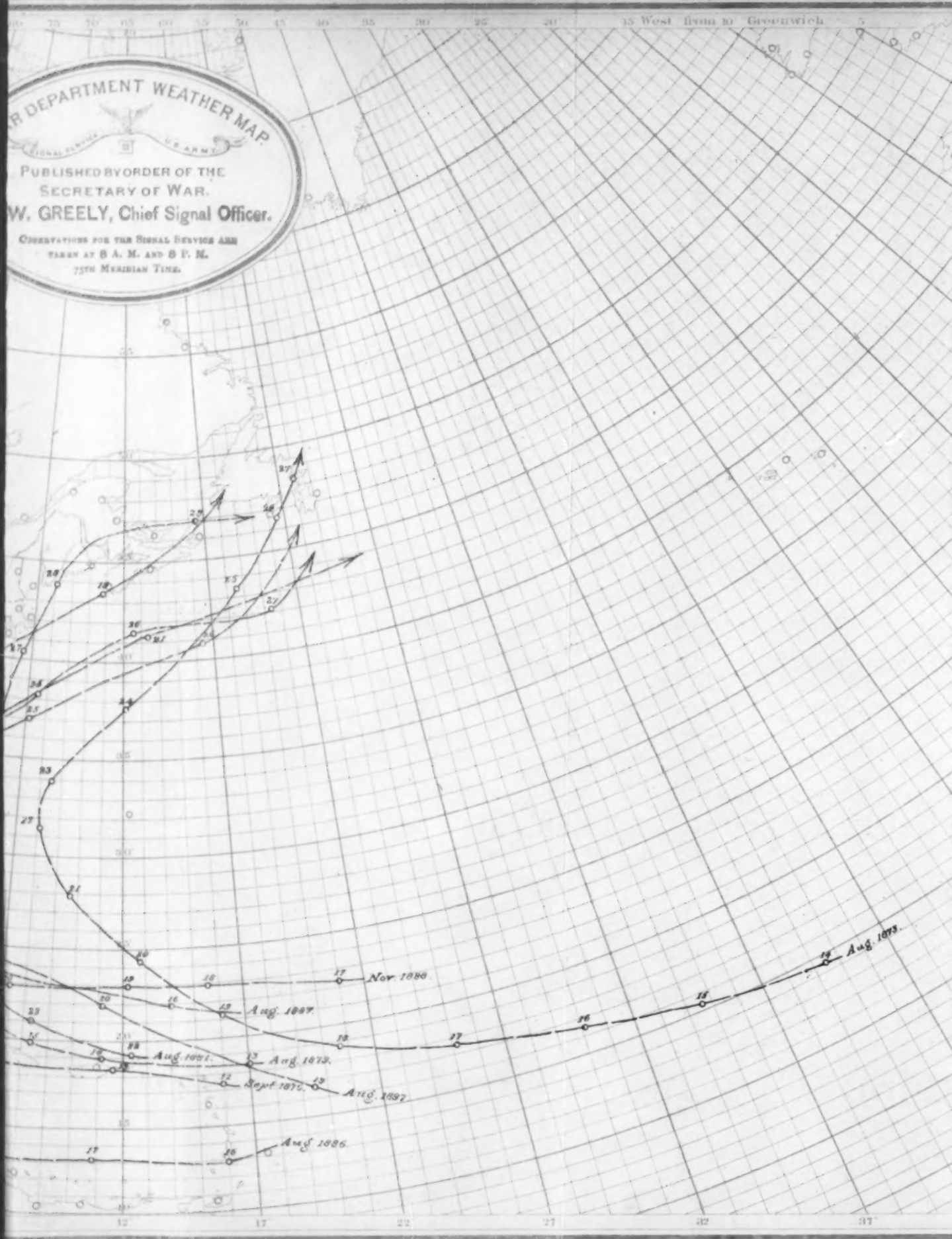
Scale of Shades.
0 to 2 inches.
2 , 4 ,
4 , 6 ,
6 , 8 ,
over 8 ,
WAR DEPARTMENT WEATHER MAP.
PUBLISHED BY ORDER OF THE SECRETARY OF WAR.
A. W. GREELY, Chief Signal Officer.
Observations for the Signal Service are taken at 8 A. M. & 8 P. M., 75th Meridian Time.

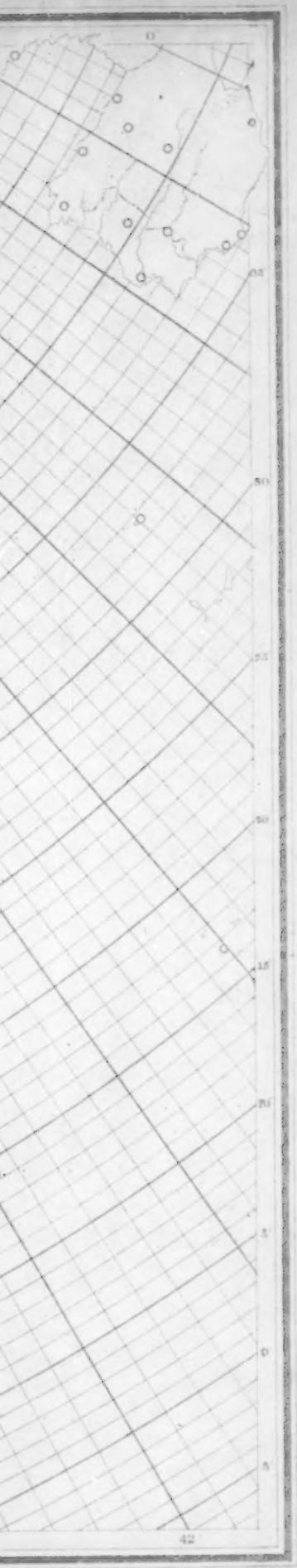
Form 106 C 1884

CHART VII. TRACKS OF WEST INDIAN HURRICA


WAR DEPARTMENT WE
SIGNAL SERVICE
PUBLISHED BY ORDER
SECRETARY OF W
A. W. GREELY, Chief S
OBSERVATIONS FOR THE SIGNAL
TAKEN AT 8 A. M. AND 8
75TH MERIDIAN TIM
West from 3 Washington East 2 from Washington

WEST INDIAN HURRICANES PASSING ALONG THE COAST OF THE UNITED STATES.



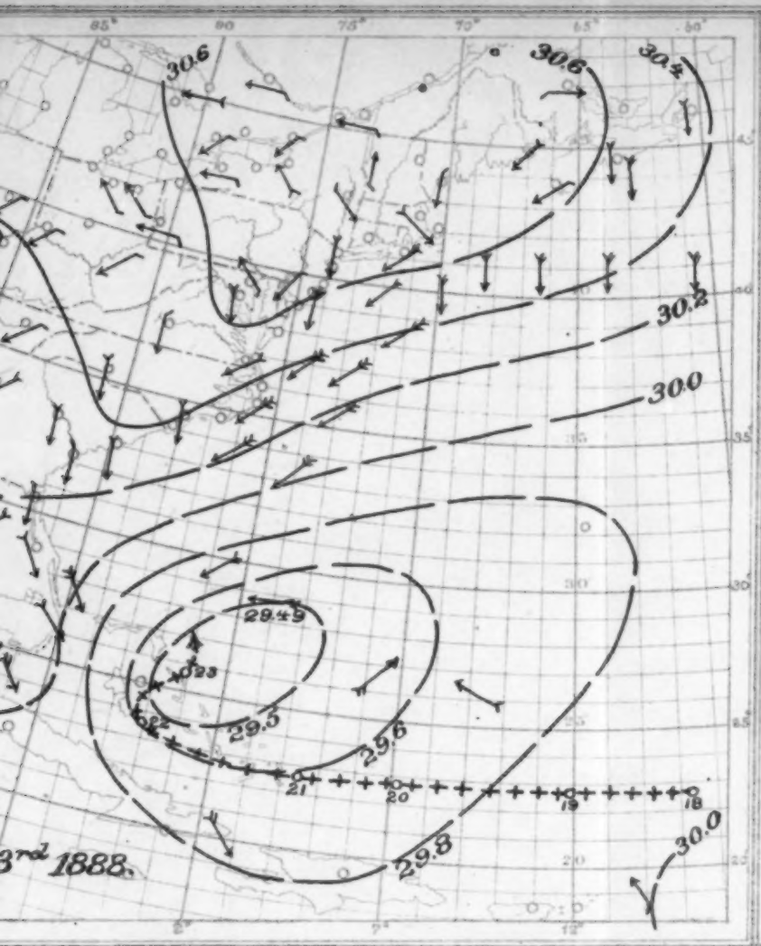


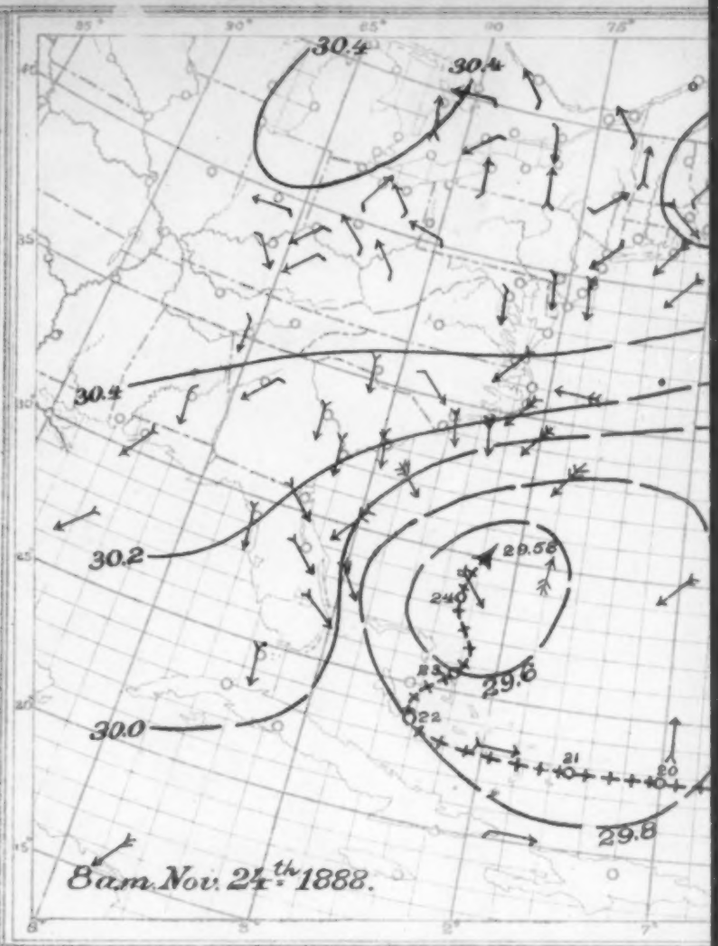
Signal Office Lith.

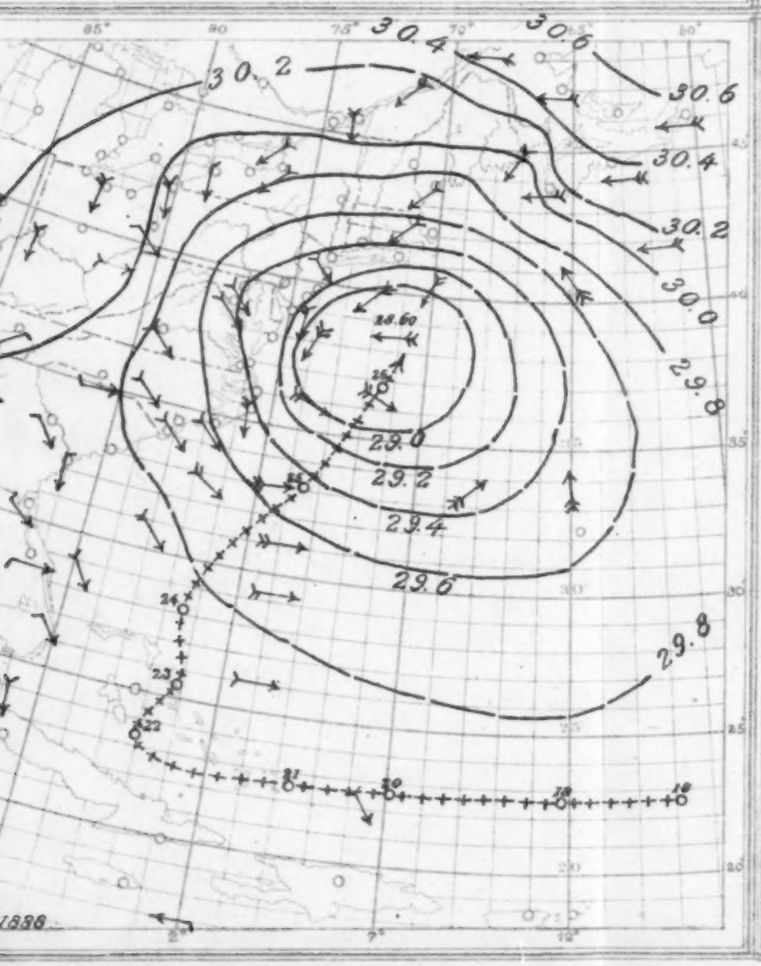
30.4
30.2
30.0
8a.m. Nov. 23rd 18

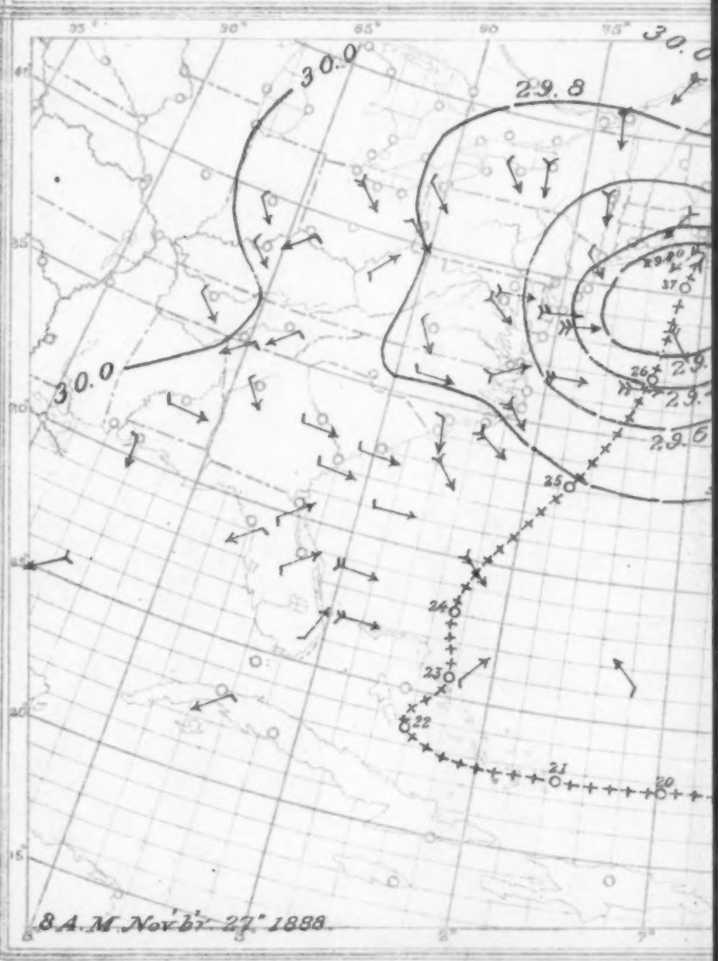
30. 2
30. 0
8 A.M. Novbr 24th 1838

CHART VIII. SHOWING METEOROLOGICAL CONDITIONS ATTENDING THE SEVER

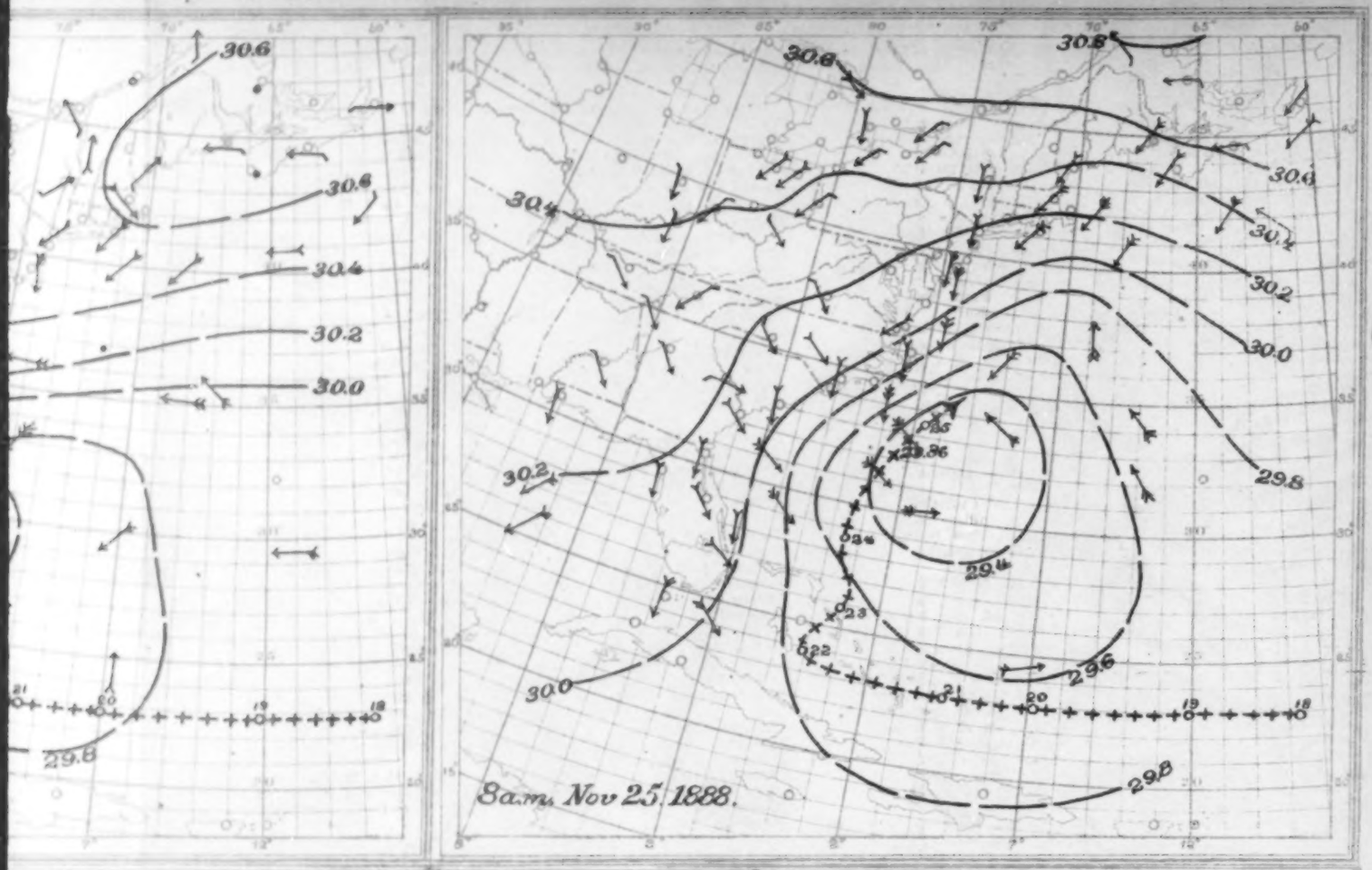


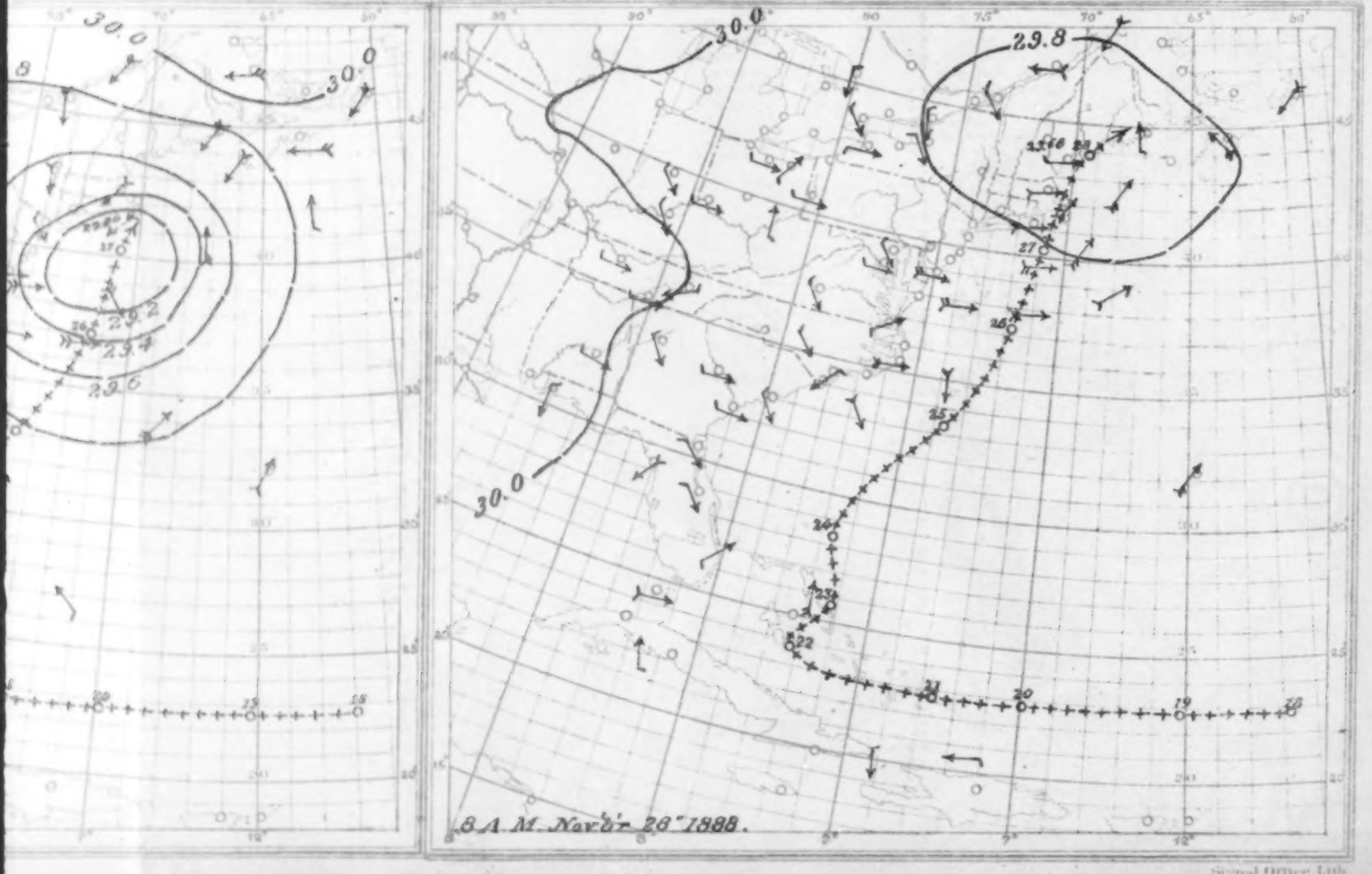






NG THE SEVERE STORM OF NOVEMBER 23D-28TH, 1888.





Signal Office Lith

List of voluntary stations of the Signal Service, with their respective observers, who furnish meteorological reports for the Monthly Weather Review. Those marked with an asterisk (*) did not send reports in time to be used in Review for November, 1888.

Place of observation and observer.

ALABAMA.
Auburn, Alabama Weather Service.
Citronelle, J. G. Michael.
Livingston, J. W. A. Wright.
New Market, Dr. Geo. D. Norris.

ARIZONA.
Antelope Valley, Mrs. J. H. Hamilton.
Ash Canyon, John S. Robbins.
*Bangharts, ———
Cedar Springs, R. E. Norton.
Flagstaff, Mrs. F. B. Jacobs.
Globe, J. H. Hamill.
Holbrook, David Rope.
Huachuca, J. W. Stump.
*Lochiel, San Rafael Cattle Company.
*Prescott Junction, W. W. Burnett.
*Showlow, C. E. Cooley.
Teviston, Miss Belle Tevis.
Tucson, Edward L. Wetmore.
Williams, J. T. Ryan.
Willow Springs, F. A. Chamberlin.
Winslow, L. W. Roberts.

ARKANSAS.
Lead Hill, Silas C. Turnbo.
Little Rock, Arkansas Weather Service.

CALIFORNIA.
*Anderson, Dr. A. Fouch.
Banning, Welwood Murray.
Barstow, Geo. R. Gooding.
Georgetown, C. M. Fitzgerald.
Handford, Dr. W. H. Miller; N. E. Gribi.
Hydesville, E. T. Foss.
Lewis Creek, John Touhy.
*Needles, John J. Clark.
Oakland, Dr. J. B. Trembley.
Oroville, Hiram Arents.
Sacramento, S. H. Gerrish.
Salinas, Dr. E. K. Abbott.
Santa Barbara, H. D. Vail.
Santa Maria, L. E. Blochman.
Susanville, T. B. Sanders.
Willow, David Bentley.

COLORADO.
*Bennett, I. S. Putnam.
*Colorado Springs, Colorado Weather [Service.
Delta, J. A. Curtis.
Fort Collins, Prof. L. G. Carpenter.
Georgetown, W. A. Jayne, M. D.
Greeley, J. G. Reid.
Rocky Ford, F. Watrous.

CONNECTICUT.
Hartford, Wm. R. Matson.
New Hartford, Wm. Goodwin.
*Southington, Luman Andrews.
Voluntown, Rev. E. Dewhurst.

DAKOTA.
Brookings, Prof. Lewis McLouth.
Davenport, J. W. Leech.
Gallatin, S. J. Pound.
Garden City, W. C. T. Newell.
Goddard, Mrs. M. F. Goddard.
Grand View, J. F. Angus.
Highmore, W. R. McDowell.
Kimball, A. S. Stuver.
New England City, E. S. Clough.
*Richardton, Prof. A. Nordberg.
Webster, Arthur Betts.
Woonsocket, L. O. Libbey.

DELAWARE.
Newark, Prof. Geo. A. Harter.
Kirkwood, Wm. Carnagy.

DISTRICT OF COLUMBIA.
Kendall Green, Deaf & Dumb Institute.
Receiving Reservoir, Distributing Reservoir, Rock Creek Bridge } Washington Aqueduct.

FLORIDA.
Altamonte Springs, E. P. Tebeau.
Alva, Chas. E. Robins.
Archer, Dr. J. C. Neal.
Fort Meade, A. H. Adams.
Homeland, J. S. Wade.
Manatee, Mrs. Mary W. Broberg.
Merritt's Island, Rev. J. H. White.
Tallahassee, Rev. Dr. W. H. Carter.

GEORGIA.
Andersonville, H. W. Bryant.
Athens, Prof. L. H. Charbonnier.
Duck, A. L. Gillespie.
Forsyth, Thos. G. Scott.
Hephzibah, R. L. Rhodes.
Marietta, G. S. Owen.
Milledgeville, S. A. Cook.
Quitman, J. L. Cutler.
Thomasville, C. S. Boudurant.

Place of observation and observer.

IDAHO.
Lewiston, Robert Schleicher.

ILLINOIS.
Charleston, J. B. Dazey.
Collinsville, Dr. J. L. R. Wadsworth.
*Jacksonville, P. J. Hasenstab.
*Mattoon, Wm. Dozier.
Mount Morris, Wm. Feary.
Oswego, John S. Seely.
Palestine, John E. Templeton.
*Pekin, Rev. J. E. Terborg.
*Peoria, Dr. Fred. Brendle.
Philo, H. A. Burr.
Riley, John W. James.
Rockford, T. D. Robertson.
Sandwich, Dr. N. E. Ballou.
*South Evanston, Dr. M. D. Ewell.
Springfield, Illinois Weather Service.
Sycamore, Roswell Dow.
*Windsor, A. H. Hatch.

INDIANA.
Butlerville, C. F. Hole.
*Connersville, Robt. Hessler.
Jeffersonville, J. C. Loomis.
Laconia, Lafe Crozier.
La Fayette, Indiana Weather Service.
Logansport, Thos. B. Helm.
Mauzy, Elwood Kirkwood.
Salem, J. W. May.
*Scalesville, Urias Wilson.
*Sunman, B. F. Ferris.
*Vevay, Prof. Chas. Boerner.

INDIAN TERRITORY.
*Caddo Creek, B. Leming, M. D.

IOWA.
Amana, Conrad Schadt.
*Ames, J. Rush Lincoln.
*Bancroft, H. N. Renfrew.
Cedar Rapids, H. D. Olds.
Clarinda, A. S. Van Sandt.
Clinton, Luke Roberts.
Cresco, Gregory Marshall.
Cromwell, Harry C. Harrison.
*Denmark, G. B. Brackett.
Des Moines, Adolphus Voegeli.
Dysart, Jos. Dysart.
Elkader, J. N. Hamilton.
Fayette, Upper Iowa University.
Fort Madison, Miss L. A. McCready.
Glenwood, Seth Dean.
Glenwood, A. Schappel.
Grinnell, Prof. S. J. Buck.
Hampton, E. C. Grenelle.
Humboldt, Miss. Florence Prouty.
Independence, Emil F. Wülfke.
Iowa City, Prof. A. A. Veblen.
Iowa City, Iowa Weather Service.
Logan, Mrs. M. B. Stern.
Manson, W. L. Thompson.
Maquoketa, A. B. Bowers.
Monticello, H. D. Smith.
*Mount Pleasant, Prof. Max E. Witte.
Mount Vernon, Prof. Alonzo Collin.
Muscatine, J. P. Walton.
Osage, G. D. Pettingill.
Osceola, F. M. Kyte.
Oskaloosa, Joseph Boyd
Oskaloosa, O. H. Avey.
Sac City, Dr. Caleb Brown.
Smithland, Dr. Chas. W. Rice.
Vinton, T. F. McCune.
Washington, Wm. A. Cook.
Wesley, Wm. Ward.

KANSAS.
Allison, John J. Cass.
Bendena, G. Campbell.
Cunningham, E. Shaw.
Elk Falls, Dr. A. C. Williams.
*Emporia, Prof. J. H. Dinsmore, Jr.
Englewood, C. D. Perry.
Globe, Wm. Featherston.
Havensville, L. W. Dennen.
Independence, J. M. Altaffer.
La Harpe, Isaac S. Coe.
Lawrence, Prof. F. H. Snow
Lebo, C. W. Burnet.
Leoti, L. C. Vickrey.
Manhattan, C. P. Blachley.
*Manhattan, F. J. Rogers.
Morse, R. P. Edgington.
Salina, J. H. Gibson.
Santa Fe, Geo. W. Ball.
Sedan, J. W. Goodell.
Topeka, Kansas Weather Service.
Tribune, S. B. Jackson.

Place of observation and observer.

KANSAS—*Continued.*
Wakefield, Wm. P. Cochran.
Wellington, John H. Wolfe.
*Wilson, Miss Lizzie Dolphin.
Yates Centre, F. R. Gray.

KENTUCKY.
Bowling Green, M. H. Crump.
Carlisle, W. H. Fritts.
*Elkin, Chas. Ogden.
Frankfort, E. C. Went.
Louisville, Kentucky Weather Service.
Millersburgh, C. Pope.
South Fork, A. B. Gilbert.

LOUISIANA.
Grand Coteau, Rev. C. M. Widman.
Liberty Hill, E. A. Crawford.
Luling, F. M. Rogers.
New Orleans, Louisiana Weather Service.

MAINE.
Bar Harbor, Joseph Wood.
Cornish, Silas West.
Gardiner, Henry Richards.
Kent's Hill, W. C. Strong.
Orono, Prof. M. C. Fernald.

MARYLAND.
Barren Creek Sp'gs, Albert E. Acworth
Cumberland, E. T. Shriver.
Fallston, Prof. G. G. Curtis.
Gaithersburgh, John T. De Sellum.
Galena, Henry Parr.
Gambrill's, J. E. Moque.
Great Falls, Washington Aqueduct.
Jewell, Jos. Plummer.
McDonogh, McDonogh Institute.
M't St. Mary's, M't St. Mary's College.
Woodstock, Woodstock College.

MASSACHUSETTS.
Amherst, Miss S. C. Snell.
Amherst, Massachusetts Agricultural Experimental Station.
Blue Hill, Rev. A. K. Teele.
Blue Hill Observatory, A. L. Rotch.
Cambridge, Harvard College Obs'y.
Deerfield, Rev. A. Hazen.
Dudley, Conant Observatory.
Fall River, C. V. S. Remington.
Heath, B. B. Cutler.
New Bedford, Thomas R. Rodman.
Newburyport, F. V. Pike.
Provincetown, John R. Smith.
Royalston, Miss Lizzie W. Chase.
Somerset, Elisha Slade.
Taunton, E. U. Jones, M. D.
Westborough, G. S. Newcomb.
*Williamstown, Williams College Obs.
*Worcester, J. B. Hall.

MICHIGAN.
Benton Harbor, A. J. McCave.
Birmingham, S. Alexander.
Harrisville, Dr. D. W. Mitchell.
Hudson, Major A. H. Boies.
Kalamazoo, W. A. Black.
Lansing, Dr. H. B. Baker.
Lansing, Michigan Weather Service.
Marshall, G. H. Greener, M. D.
*Mio, J. Randall.
Mottville, J. A. Hartzler.
Thornville, John S. Caulkins.
Traverse City, S. E. Wait.
Ypsilanti, J. C. Bemiss.

MINNESOTA.
*Argyle, J. J. Stone.
Le Sueur, L. B. Davis.
Minneapolis, Wm. Cheney.
Northfield, Minnesota Weather Service.

MISSISSIPPI.
Biloxi, Dr. R. G. Hinsdale.
*Jackson, W. J. Brown, Jr.
Palo Alto, W. H. Hill.
University, Mississippi Weather Service.

MISSOURI.
Conception, Rev. M. Eckstein.
Excelsior Springs, A. Reinisch.
*Fayette, Prof. T. Berry Smith.
Frankford, W. W. Vermillion.
Grand Pass, E. R. Graham.
Lakenan, C. Ayres.
New Frankfort, G. W. Hawkins.
Ozark, J. J. Brown.
*Pierce City, J. J. Spilman.
Princeton, Wm. Hirons.
St. Louis, Missouri Weather Service.

MONTANA.
Virginia City, Eugene Stark.

Place of observation and observer.

NEBRASKA.
Crete, Nebraska Weather Service.
Culbertson, G. D. Carrington.
*David City, John R. Townsend.
De Soto, Chas. Seltz.
Fairbury, Dr. I. Humphrey.
Falls City, A. B. Newkirk.
Fremont, Isaac E. Heaton.
Genoa, Geo. S. Truman.
Hay Springs, Wm. Waterman.
Kimball, Wm. G. Barton.
Lincoln, University of Nebraska.
Marquette, John Ellis.
Syracuse, P. W. Risser.
Tecumseh, W. L. Dunlap.
Weeping Water, G. Trent.

NEVADA.
*Carson City, Chas. W. Friend.
Carson City, Nevada Weather Service.

NEW HAMPSHIRE.
Antrim, Frank W. Palmer.
Berlin Mills, O. A. Bridges.
Concord, W. L. Foster.
Nashua, Chas. H. Webster.
*Ashland, Belmont, Bristol, Lake Village, Weir's Bridge, Wolfeborough, } Lake Winnipiseogee Cotton and Woollen Manufacturing Co.
Shaker Village, N. A. Briggs.

NEW JERSEY.
Beverly, C. F. Richardson.
Clayton, W. T. Wilson.
Egg Harbor City, H. Y. Postma.
Moorestown, Thos. J. Beans. [Service.
New Brunswick, New Jersey Weather
Readington, John Fleming.
South Orange, Dr. W. J. Chandler.
*Vineland, Dr. O. H. Adams.

NEW MEXICO.
Coolidge, B. S. Mullin.
Gallinas Spring, J. E. Whitmore.
Las Vegas, F. W. Chatfield.

NEW YORK.
Ardenia, Richard B. Arden.
Auburn, Geo. Casey.
Boyd's Corners, Thomas Manning.
Cooperstown, G. Pomeroy Keese.
Eden, W. P. Hunt.
Factoryville, T. P. Yates.
Friendship, Jesse D. Rogers.
Geneva, Mrs. N. S. Yates.
Hess Road Station, C. H. Spaulding.
Humphrey, Chas. E. Whitney.
Ilion, G. A. Trowbridge.
Ithaca, Cornell University.
Ithaca, New York Weather Service.
Le Roy, Prof. F. M. Comstock.
Lyon, Dr. M. A. Veeder.
Middleburgh, F. K. Straub.
New York, Central Park Observatory.
Nineveh, W. J. Barnet.
*North Volney, J. M. Patrick.
Palmyra, L. D. Cummings.
Pendleton, W. D. Lovell.
Penn Yan, Geo. R. Young.
Rose, George Smart.
Savona, M. S. Collier, M. D.
Setauket, Selah B. Strong.
Somerset, J. W. Thurber.
South Canisteo, J. W. Wilson.
Utica, Thomas Birt.
Vermillion, E. B. Bartlett.
Waddington, Jos. Graves.
White Plains, Prof. O. R. Willis.

NORTH CAROLINA.
Chapel Hill, Prof. J. W. Gore.
Hot Springs, Dr. W. F. Ross.
Lenoir, Dr. R. L. Beall.
*Raleigh, Thos. C. Harris.
Raleigh, North Carolina Weather Service.
Statesville, W. A. Eliason.
*Tarborough, E. V. Zreller.
Weldon, T. A. Clark.

OHIO.
Bellevue, Wm. Sheffield.
Cleveland, G. A. Hyde.
College Hill, John W. Hammitt.
Collinwood, Wm. Smeed.
Columbus, Ohio Weather Service.
Demos, B. B. Ault.
Elyria, C. W. Goodspeed.
Garrettsville, S. M. Luther.
Gracey, H. M. Scott.

List of voluntary stations of the Signal Service, with their respective observers, who furnish meteorological reports for the Monthly Weather Review—Cont'd.

Place of observation and observer.
OHIO—*Continued.*
Jacksonborough, Dr. J. B. Owsley.
Lordstown, W. S. Dean.
Napoleon, Dr. T. C. Hunter.
New Athens, T. M. Sewell.
North Lewisburgh, H. D. Gowey.
Portsmouth, Dr. D. B. Cotton.
Ruggles, Peter Bowman.
Tiffin, Rev. T. H. Sonedecker.
Wauseon, Thos. Mikesell.
Westerville, Prof. John Haywood.
West Milton, Luke S. Motte.
Yellow Springs, Chas. W. Rice.
OREGON.
Albany, John Briggs.
Bandon, Geo. Bennett.
East Portland, Dr. Geo. Wigg.
Eola, Thos. Pearce.
*La Grande, J. K. Romig.
McMinnville, Prof. W. J. Crawford.
Mount Angel, Rev. F. Barnabas Heid.
Roseburgh, Oregon Weather Service.
*Yaquina L. H., Dr. John G. Jessup.
PENNSYLVANIA.
Altoona, Chas. B. Dudley, M. D.
Catawissa, Robt. M. Graham.
*Clarion, Prof. C. M. Thomas.
Corry, Wm. Loveland.
*Drifton, H. D. Miller.
Dyberry, Theo. Day.
Easton, Dr. J. W. Moore.
Franklin, Joseph Bell.
Germantown, Thos. Meehan.
Grampian Hills, Nathan Moore.
Haverford, Prof. F. P. Leavenworth.
*Johnstown, E. C. Lorentz.
Meadville, David Logan. [Service.
Philadelphia, Pennsylvania Weather
Philipsburgh, G. F. Dunkle.
Quakertown, J. L. Hancock.
Reading, C. M. Dechant.
Salem Corners, T. B. Orchard, M. D.
State College, Agricultural Experimental Station.
Troy, M. Gustin.
Wellsborough, Hiram D. Deming.
West Chester, Dr. Jesse C. Green.
*Westtown, Wm. F. Wickersham.
SOUTH CAROLINA.
Aiken, Dr. W. H. Geddings.

Place of observation and observer.
SOUTH CAROLINA—*Continued.*
Cedar Springs, J. T. Bayerly. [vice.
Columbia, South Carolina Weather Ser-
Kirkwood, Colin Macrae.
Statesburgh, Dr. W. W. Anderson.
TENNESSEE.
Ashwood, Rev. C. F. Williams.
Austin, P. B. Calhoun.
Milan, Dr. M. D. L. Jordan.
Nashville, State Board of Health.
Riddleton, F. K. Fergusson.
TEXAS.
Austin, Oscar Samostz.
Bear Creek Ranche, W. H. Potter.
Cedar Hill, J. P. Berry.
Cleburne, Dr. T. C. Osborn.
College Station, Prof. J. H. Kinealy.
*Colorado, Fred R. Blount.
*Comanche, E. N. Wiesenhanger.
Corsicana, W. H. Hamilton.
Decatur, H. D. Donald.
Gallinas, Lum Woodruff.
Galveston, Texas Weather Service.
Granbury, E. H. Snider.
Lampasas, Dr. C. M. Ramsdell.
Mesquite, Silas G. Lackey.
Mexia, Chas. F. Mercer.
New Ulm, C. Runge.
Silver Falls, C. M. Tilford.
VERMONT.
Brattleborough, W. H. Childs.
Burlington, W. B. Gates.
Coventry, W. H. Tibbetts.
East Berkshire, J. H. Mears.
Lunenburgh, Dr. Hiram A. Cutting.
Manchester, Rev. E. P. Wild.
Middlebury, S. Holton.
Newport, M. B. Trasher.
Saint Johnsbury, F. Fairbanks.
Stratford, H. F. J. Scribner.
VIRGINIA.
Bird's Nest, C. R. Moore.
Christiansburgh, H. D. Walters.
Dale Enterprise, J. L. Heatwole.
Marion, A. T. Lincoln.
*Petersburgh, Jas. M. Colson, Jr.
*Rappahannock, W. H. Ireland.
Spottsville, R. W. Jones.
Summit, J. R. Sim.

Place of observation and observer.
VIRGINIA—*Continued.*
University of Va., James Wearmouth.
*Variety Mills, J. H. Micklem.
Wytheville, Howard Shriver.
WASHINGTON TERRITORY.
Blakeley, R. M. Hoskinson.
Tacoma, E. N. Fuller.
*Vashon, Mrs. C. B. Carpenter.
WEST VIRGINIA.
*Clarksburgh, R. T. Lowndes.
Hartmonsville, W. C. Tobin.
Helvetia, Dr. C. T. Stucky.
Middlebrook, S. F. H. Hewit.
*Parkersburgh, T. G. Field.
Rockport, R. D. J. Echels.
Tyler Creek, F. M. Swann.
White Sulpher Springs, T. Surber.
WISCONSIN.
*Beloit, Beloit College Observatory.
Cadiz, B. C. Curtis.
Delavan, George L. Collie.
Deuster, G. H. Kruschke.
*Embarrass, J. E. Breed.
Fond du Lac, J. C. Wedge.
Fredonia, B. H. Meyer.
*Lancaster, Edward Pollock.
Lincoln, A. J. Loose.
Madison, Washburn Observatory.
Manitowoc, Miss Clasina Lüps.
Oshkosh, Prof. W. N. Mumper.
Wauconsta, G. H. Yapp.
Weston, R. R. Wilkinson.
FOREIGN.
Burnside, S. A., Dr. C. J. Hering.
Grand Turk, W. Indies, Geo. I. Gibbs.
Guanajuato, Mexico, Met'l Obs'y.
Hamilton, Bermuda, General Russell Hastings.
Kiliisnoo, Alaska, Jos. Zuboff.
*Leon, Mexico, Prof. M. Leal.
Mazatlan, Mexico, Leon P. Acosta.
Mexico, Mexico, Meteorological Obs'y.
*Monterey, Mexico, Dr. Wm. De Ryee.
Montreal, Quebec, C. H. McLeod.
New Westminster, B.C., Capt. A. Peele.
Port au Prince, Hayti, Prof. I. Scherer.
*Pueblo, Mexico, Catholic Institute.
*Zacatecas, Mexico, Jose A. y Borrilla.

Place of observation and observer. New observers, commencing observations November, 1888.
M't Willing, Ala., W. M. Garret.
Eagle Pass, Ariz., Dr. R. B. Tripp.
Winslow, Ariz., C. B. Yost.
Colegrove, Cal., Seward Cole.
Nicolaus, Cal., Alvah Pendleton.
Riverside, Cal., A. K. Holt.
Spring Lake, Dakota, A. Gould.
Viola, Del., J. A. Farlow.
Kissimmee, Fla., E. E. W. Brewster.
Jimtown, Ind. T., M. M. Yeakley.
Ashland, Ky., J. M. Ferguson.
Falmouth, Ky., F. G. Held.
Madisonville, Ky., T. J. Gill.
Owensborough, Ky., Watkins & Carter.
Owenton, Ky., J. S. Cox.
Marksville, La., Leon Molenar.
Franklinton, La., T. M. Babington.
Ypsilanti, Mich., C. S. Woodard.
Minneapolis, Minn., Prof. W. A. Pike.
Hannibal, Mo., A. E. Trabue.
Sheldon, Mont., P. J. Bond.
Ansley, Nebr., P. Fowlie.
Jersey City, N. J., W. Babcock.
Angelica, N. Y., J. P. Slocum.
Barnes' Corners, N. Y., W. C. Fawdrey
Canton, N. Y., Henry Priest.
Constableville, N. Y., R. Sanford Miller
Johnstown, N. Y., W. S. Snyder.
Lowville, N. Y., W. Hudson Stephens.
North Hammond, N. Y., C. A. Wooster
Potsdam, N. Y., Peter Vilas; G. W. F. Smith.
Queensbury, N. Y., DeWitt E. Jenkins
Trumansburgh, N. Y., W. H. Jeffers.
Wedgewood, N. Y., O. F. Corwin.
Fostoria, Tenn., Charles Foster.
Belton, Tex., E. A Sterling.
Brenham, Tex., J. G. Sloan.
Brownwood, Tex., J. F. Mayo.
College Station, Tex., Prof. J. H. Kinealy
Columbia, Tex., J. S. Rogers.
Corsicana, Tex., E. L. Gibson.
Fort Worth, Tex., W. Dryden.
Houston, Tex., A. Hutchinson.
Huntsville, Tex., G. Buckingham.
Longview, Tex., G. W. Krech.
Waco, Tex., W. H. Godber.

Military posts from which meteorological reports were received, through the Surgeon General of the Army, in time to be used in the preparation of the Monthly Weather Review for November, 1888.

Alabama.	*Colorado.*	*Idaho.*	*Massachusetts.*	*Nebraska*—Cont'd.	*New York*—Cont'd.	*Virginia.*
Mount Vernon B'ks.	Lewis, Fort.	Boisé Barracks.	Warren, Fort.	Sidney, Fort.	West Point.	Monroe, Fort.
Arizona.	*Lyons, Fort.	Sherman, Fort.	*Michigan.*	*Nevada.*	*Oregon.*	*Washington Ter.*
Huachuca, Fort.	*Dakota.*	*Indian Territory.*	Brady, Fort.	McDermitt, Fort.	Klamath, Fort.	Spokane, Fort.
McDowell, Fort.	A. Lincoln, Fort.	Gibson, Fort.	Mackinac, Fort.	*New Mexico.*	*Rhode Island.*	Townsend, Fort.
Mojave, Fort.	Bennett, Fort.	Reno, Fort.	*Minnesota.*	Bayard, Fort.	Adams, Fort.	Vancouver, Fort.
Whipple Barracks.	Meade, Fort.	Supply, Fort.	Snelling, Fort.	Seldon, Fort.	*Texas.*	Walla Walla, Fort.
Arkansas.	Pembina, Fort.	*Kansas.*	*Montana.*	Union, Fort.	Clark, Fort.	*Wyoming.*
Hot Springs.	Randall, Fort.	Hays, Fort.	Assinaboine, Fort.	Wingate, Fort.	Concho, Fort.	Bridger, Fort.
California.	Sisseton, Fort.	Leavenworth, Fort.	Custer, Fort.	*New York.*	Davis, Fort.	D. A. Russell, Fort.
Angel Island.	Sully, Fort.	Riley, Fort.	Keogh, Fort.	Columbus, Fort.	Elliott, Fort.	Laramie, Fort.
Alcatraz Island.	Totten, Fort.	*Maine.*	Maginnis, Fort.	David's Island.	Hancock, Fort.	McKinney, Fort.
Benecia Barracks.	Yates, Fort.	Preble, Fort.	Missoula, Fort.	Hamilton, Fort.	McIntosh, Fort.	Pilot Butte, Camp.
Bidwell, Fort.	*Florida.*	*Maryland.*	*Shaw, Fort.	Madison Barracks.	Ringgold, Fort.	Sheridan, Camp.
Gaston, Fort.	Saint Francis B'ks.	McHenry, Fort.	*Nebraska.*	Niagara, Fort.		Washakie, Fort.
Mason, Fort.			Niobrara, Fort.	Plattsburgh Barracks.		
Presidio of San F.			Robinson, Fort.	Wadsworth, Fort.		

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